UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 HANFORD PROJECT OFFICE
712 SWIFT BOULEVARD, SUITE 5
RICHLAND, WASHINGTON 99352

9307707

September 10, 1993

Steven H. Wisness
Hanford Tri-Party Agreement Manager
U.S. Department of Energy
P.O. Box 550, A5-15
Richland, Washington 99352

Re: Public, EPA, and Ecology Comments on the Columbia River Impact Evaluation Plan; Rev 0 (June, 1993)

Dear Mr. Wisness:

Enclosed are comments provided by the U.S. Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) as well as the public comments on Revision 0 of DOE/RL-92-28 entitled "Columbia River Impact Evaluation Plan" (CRIEP). EPA and Ecology share regulatory responsibility for M-30-02 efforts. The EPA is coordinating the public comments on the CRIEP. This document underwent concurrent public/regulatory review. We are therefore providing a concurrent submittal of comments. The original 30-day public comment period was extended to 60 days in response to numerous public requests. The public comment period ended September 4, 1993. We are pleased with the high level of public interest shown in this document, and appreciate the quality and breadth of the comments provided. The public comments will provide many useful recommendations and directions for future river efforts.

The predominant public message is that the assessment portion of the CRIEP (chapters 1-4) is wholly inadequate to support conclusions of no significant impacts. This echoes the regulator's messages in comments on earlier drafts of the document (see for example the quoted comment beginning on page 2 of the enclosure). We have not endorsed the U.S. Department of Energy (DOE) approach to assessment or the conclusion of no significant adverse impacts to the river. We have previously stated that we would not be a partner in the assessment portion of the document.

We request that the assessment portion of the CRIEP be removed, and the remaining plan become the CRIEP. We will work with DOE on this plan to finalize the M-30-02 milestone effort. The assessment portion of the document should be revised by DOE in light of public comments, our comments from earlier drafts on the errors in the general approach, and published as a DOE-only rather than a Tri-Party Agreement document. We are currently scoping a comprehensive Columbia River assessment with DOE that

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will evaluate, in depth, many of the comments provided by the public in reference to the CRIEP. Many of the technical questions addressing expansion of the scope are appropriately addressed in the comprehensive assessment. We, however, recommend that DOE correct the errors in the initial impact evaluation in light of the public's comments.

Within the attachment, I have provided a brief background on the CRIEP for convenient reference by comment reviewers. Except for one reviewer's set of comments, the rest have been compiled into electronic format, numbered sequentially, and electronically mailed to your technical staff to facilitate their comment response efforts. The one reviewer's comments are provided in hard-copy format only.

We look forward to your response to the attached comments. If you need our help in responding to comments pertaining to the plan portion of the document, we will be glad to provide it. Concurrent with this letter, I am transmitting the original copy of all public comments to the administrative record. If you have any questions about this letter or the enclosure, please contact me at (509) 376-9884.

Sincerely,

Laurence E Gadbois

Laurence E. Gadbois
Environmental Scientist

Enclosure (1) Public, EPA and Ecology Comments, with an Introduction to the "Columbia River Impact Evaluation Plan", DOE/RL-92-28, Revision 0; June, 1993

cc w/Enc.1:
Bryan Foley, DOE
Steve Cross, Ecology
Roger Stanley, Ecology
Darci Teel, Ecology
Becky Austin, WHC
Steve Weiss, WHC
Administrative Record, 100 Area, w/ Public Comment Originals

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Public, EPA and Ecology Comments, with an Introduction to the "Columbia River Impact Evaluation Plan", DOE/RL-92-28, Revision 0; June, 1993

CONTENTS

I. INTRODUCTION

This enclosure contains the comments provided by the public, EPA and Ecology on the CRIEP[1]. The initial 30 day comment period began July 6, 1993. The original comment period was extended an additional 30 days in response to numerous requests. The public comment period closed September 4, 1993.

For clarity, and to assist in the comment response process, a number of things have been done with the comments. Comments that arrived well ahead of the deadline or on floppy disk were compiled and sequentially numbered. Slight editing was done for clarity. (As an example, the CRIEP, DOE, EPA, and Ecology were referred to numerous different ways. A common acronym was used throughout the comments.) There were a number of comments that we deemed were non-responsive and are not included in the numbered portion of the comments. Non-responsive comments were those that had nothing to do with the CRIEP or the Columbia River in general, or simple statements that we deemed were not of a comment nature nor did they invite a response. The original for all comments has been placed in the 100 Area CERCLA administrative record for Hanford. Comments are sequentially numbered to facilitate their reference in comment responses. All comments except those of the Nez Perce Tribe are included in the numbered comments section. The Nez Perce Tribe comments are the additional comments, section V. The Nez Perce Tribe comments were sent at the end of the first comment period. My understanding is that additional comments, and perhaps some revision to the original set of comments have been transmitted but not yet received as of September 10, 1993. Should they arrive, they will be forwarded to DOE as well for responses.

The CRIEP was written in response to TPA milestone M-30-02 that called for DOE to "Submit a plan (primary document) to EPA and Ecology to determine cumulative health and environmental impacts to the Columbia River, incorporating results obtained

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[1] Please see appendix A for a glossary of terms and acronyms used in this enclosure.

under M-30-01" by May, 1992. Note: M-30-01 evaluated the impact from contaminated springs and seeps along the 100 area of the Columbia River.

The original publication of this document was as draft A, in May, 1992. The EPA and Ecology provided comments on this document. Draft B of this document was published in January of 1993. Again, EPA and Ecology provided DOE comments on this document. The document was revised and published as revision 0 in June, 1993. Revision 0 was provided for public comment, and those comments are contained in this attachment. Draft A and B are mentioned because EPA and Ecology comments and DOE responses on their earlier versions of the CRIEP are quoted in this attachment. Note that the two previous document drafts and comments provided by EPA and Ecology are in the administrative record.

The M-30-02 milestone called for DOE to submit a plan to determine impacts to the Columbia River. The document that was produced in effect had two parts. Chapters 1-4 attempted to determine the impact to the river, and chapter 5 was the plan that the milestone called for. The EPA and Ecology had significant disagreement with DOE over the approach used in chapters 1-4. The DOE endorsed the methodology used in chapters 1-4 and did not change that methodology in response to EPA and Ecology's comments and discussions on the topics. Chapter 5 of the document contained the information needed to satisfy milestone M-30-02. EPA and Ecology decided that pursuit of the disagreement over the modeling and risk assessment approach and conclusions of impact contained in chapters 1-4 would fail to have value added to the initial impact evaluation plan. EPA and Ecology decided that our value added would be to continue to work with DOE on chapter 5 of the document, which is the actual river impact evaluation plan. Below is quoted an EPA comment (letter from Larry Gadbois, EPA to Steve Wisness, DOE; March 3, 1993) on draft B of this document: [begin quote]

1) Chapter 5 vs the rest of the document.
First. This document has been written to fulfill the M-30-02 milestone. This milestone states that DOE is to "Submit a plan (primary document) to EPA and Ecology to determine cumulative health and environmental impacts to the Columbia River, incorporating results obtained under M-30-01". Chapter 5 of the CRIEP is that plan.
Second. For nearly two years the regulators have been working with DOE to develop an approach for doing risk assessments and determining contaminants of concern in connection with the "Hanford Site Baseline Risk Assessment Methodology" (HSBRAM). Through extensive negotiations with DOE, a mutually acceptable approach to conducting risk assessment and determining contaminants of concern has resulted. These negotiations were specifically for the HSBRAM which contains the risk assessment approaches for both baseline risk assessments, and qualitative risk assessments for the purposes of screening for interim

remedial measures. Thus, the HSBRAM provides both intensive/thorough and cursory approaches to risk assessments.

Negotiations on HSBRAM has been a tremendous resource drain on the regulators that is now finally resulting in a usable approach acceptable to the three parties. All three parties understood that HSBRAM was written for the purpose of guiding 1) baseline risk assessments, and 2) qualitative risk assessments for IRMs. All three parties also realized how much effort it took to reach consensus on an approach for risk assessments.

Third. In the CRIEP, DOE attempts to conduct a preliminary risk assessment and determine contaminants of concern with available data. This proved an appropriate and productive approach to identifying additional data collection or interpretation needs. However, DOE choose an approach that differed from that outlined in HSBRAM. The differences prompted comments from the regulators during the review of draft A of the CRIEP. With all the efforts DOE and the regulators went through to arrive at an acceptable way to do risk assessments and determine contaminants of concern, it is unfortunate that DOE chose a different approach in CRIEP than that advocated in HSBRAM.

Fourth. EPA recognizes that an attempted preliminary risk assessment for the purposes of identifying data needs was productive and provides valuable rational for the resulting impact evaluation plan. We do not however condone the approach to risk assessment and identification of contaminants of concern used in this document. An attempted risk assessment and contaminant of concern identification according to HSBRAM may identify additional information needs not apparent using the CRIEP's approach. In light of the resources it took to reach consensus for HSBRAM, we felt it was not worth our effort to fight many of those same battles on this document. Draft A of the CRIEP was a DOE document. When the document is revised and approved by the regulators, it becomes a tri-party document. At that point, all three parties have reached consensus. The regulators have decided that chapters 1 through 4 of this document cannot be approved, DOE does not intend to modify them to meet regulator expectations, it would not be productive use of our resources to dispute DOE over these chapters, and chapter 5 is the core of what the milestone requires.

Fifth. EPA has chosen to ignore the first 4 chapters, has reviewed and will continue to work with DOE to develop an acceptable chapter 5, and ultimately plans to approve that chapter of the document to close out this milestone.

[end quote]

The milestone M-30-02 had a narrow scope. Specifically, it was (1) to develop a plan to determine impacts to the river, (2) as a 100 Area milestone, it was to look at that specific stretch of the river in the 100 area, and (3) given the short time in which to develop the plan, it was implicit that it would be an initial effort to identify the immediate and more obvious data needs. Clearly this forms a starting point from which to initiate a more comprehensive investigation of the River. The outpouring of public comments supports the assumption that the

CRIEP, in addition to needing corrections to its current content, must be viewed as a starting point. Those public comments also provide direction for future more comprehensive work. The three parties are in the formative stages for a comprehensive assessment of the river that is already being molded by the content of public comments provided on the CRIEP.

II. EPA and ECOLOGY COMMENTS

1. As we have stated in comments on the previous draft of this document, we do not endorse the first four chapters of this document. We request that the document be revised in reference to the concerns expressed by the public. We also request that the document be split into two parts. Part A will be the Tri-Party primary document containing the "Columbia River Impact Evaluation **Plan**" as called for by milestone M-30-02. This would essentially be a revised chapter 5 of the current document. Part B would be a DOE-only document containing the modeling, risk assessment, and any determinations of impact conclusions that comprise the first four chapters of the current document. Even though we would not share ownership with the part B document, we strongly recommend that DOE incorporate public comments, as appropriate, into a revision of that document.

2. Many of the public comments call for an expansion of the technical scope and approach of the river assessment. We fully support this identified need, and is the basis for the comprehensive Columbia River assessment now in its formative stages. We recommend that DOE identify those comments that pertain to the current scope and approach of the CRIEP as opposed to those that call for an expanded scope. Specific responses should be provided, when appropriate, to those that pertain to the current scope and approach of the CRIEP. Those that call for an expanded scope should be flagged for scoping into the comprehensive river assessment.

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III. PUBLIC COMMENTS - NUMBERED

Comments numbered 1 through 7 were received from four individuals: residents of Portland, OR (1); Seattle, WA (2); and Vancouver, WA (1). The following agencies/interest groups have also provided comments (and their comment numbers are noted):

Agency for Toxic Substances and Disease Registry (110-119)
Columbia River United (128-136)
Confederated Tribes of the Umatilla Indian Reservation (202-265)
Heart of America Northwest (120-127)
National Park Service (200-201)
Nez Pierce Tribe (Section V, Additional Public Comments)
Oregon Department of Energy (137-193)
Sierra Club, Hazardous Materials Committee (194-199)
U.S. Fish and Wildlife Service (8-62)
Washington State Department of Health (63-80)
Washington State Department of Wildlife (81-92)
Yakima Indian Nation (93-109)

1. The preliminary evaluation is faulty in groundwater discharge into the Columbia River. I am concerned with the unknown chemicals and tailings that have not been of concern or recorded through the years and needs more review by independent consultants -- scientific.

   The agencies involved at Hanford need to involve the citizens of the state with summaries quarterly by newspaper (locals) because most of the documentation and time involved will lose most ordinary citizen response.

2. This initial evaluation focused upon previous studies and data collections. It continued to suggest what future plans might be considered in collecting information around and in the Columbia River.

   I was impressed, along with the writers, at not being able to find any significant amounts of uranium around the study area. I question also the inability to find any plutonium. It seems to me if the primary purpose of the facility for over forty years was to produce weapon-grade plutonium, there should be significant amounts of plutonium waste as well.

   It seems to me also if we are studying the effects on the human population an indepth study of the Native American tribes in the area is most important. For it is and has been the Native Americans that have most used the river for their uses, especially in catching and eating fish. And, if I remember correctly, very little time and effort is being focused upon Native Americans in the current study being conducted by the Department of Social and Health Services. But it is good that finally you are considering and writing about the human factor in these events of waste and cleanup at Hanford.

3. In dealing with dangerous environmental contaminants, assessment of long-term effects is essential. However, the CRIEP barely begins to address this issue (pages 90 and 91). Levels of

radioactive waste and other contaminants are discussed in CRIEP but it is critical to investigate actual toxicological effects (Gilbertson 1990).

4. Bald Eagles and Ospreys are two proven indicators of water quality (Gilbertson 1990). Eagles are mentioned as possible subjects for investigation by the CRIEP. If Osprey are also residents of Hanford Reach they should be monitored as well.

5. Anthony et al. (1993) used non-lethal techniques (i.e. sampling blood, eggs, and carcasses to determine that contaminants in the Columbia River Delta are affecting Bald Eagle productivity. Determining prey species and prey species levels of contamination of Hanford Reach Bald Eagles (and Ospreys if present) is also important because contaminants in prey species accumulate in predators. Knight et al. (1990) found that much of the contamination of inland Bald Eagles was due to ingestion of Glaucous-winged Gulls, which are also high up on the food chain.

6. Despite the fact that radiation levels are low in groundwater plumes entering the river from the 100 Area storage, these contaminants are undoubtedly being bioaccumulated. Further, low (not immediately lethal) levels of radiation over long periods have been shown to be harmful (Kneale et al, 1983). Specifically, low levels of tritium (which is now leaking into the Hanford Reach according to the CRIEP) have been found to cause an irreversible loss of germ cells in mammals (Dobson 1979). The productivity of Hanford Reach Eagles (and Ospreys) should therefore be compared with uncontaminated areas.

7. I am appalled at the ponderous pace of the CRIEP in addressing the long-term effects of Hanford waste. I encourage you to contact researchers who have done this sort of work (i.e. Knight et al and Anthony et al.) instead of attempting to "reinvent the wheel".

8. The USFWS is not familiar with the referenced source literature included in Sections 2.2.2 Surface Water Contamination, 2.2.3 River Sediment Contamination and 2.2.4 Ecological Contamination and, therefore, can not agree with the conclusion referenced to Robeck et al. 1954, (that the levels of radioactivity found in the river during the study "had no apparent immediate effect on aquatic populations"). Consequently the decision made in Section 3.0 Contaminant Fate and Transport under 3.1.3 River Sediment Pathways, that impacts due to river sediments will not be evaluated in the report appears to minimize a major source of contamination in this reach of the river. The USFWS is aware of Hyallela bioassays conducted by Ecology in 1992 to test toxicity of sediment from the Columbia River near the McNary National Wildlife Refuge. Mortality in these tests ranged from 60 to 71 percent. Standard chemical analyses of the sediments for metals, volatiles, dioxins, furans, organochlorines, phenolics, resins, and fatty acids, resulted in either non-detect levels or levels usually not associated with toxicity. Based upon these tests we

recommend that Hyallela and Microtox bioassays be included in the data collection activities in Section 5.2 for this reach of the river.

9. The list of contaminants of concern provided in the report was found to be deficient and vague. Specifically, information on analysis of non-radionuclide chemicals was unclear, with references limited to such terms as "chemical constituents" in groundwater (page 12), "comprehensive list of potential contaminants" in surface water (page 32), and "chemical parameters" in springs (page 33). At a minimum, complete lists of these chemicals, including detection limits, should be provided in the appendices. Appendices containing means and ranges of concentrations in the different sample types would be preferable. In addition, as no information was provided on the depths at which wells were screened, it is not possible to evaluate the completeness nor adequacy of the groundwater testing.

10. The USFWS is concerned with the conclusion presented on page 24, second bullet, that most contaminants of concern in surface water are not significantly different between upstream and downstream collection points. This conclusion was based upon an inappropriate statistical test. Without having access to raw data, we suggest the possibility that differences in contaminant concentrations between upstream and downstream sites for any one monthly sampling period were masked by the variability between sampling periods, when statistical comparisons were based on yearly means. We strongly recommend that these data be analyzed using a paired comparisons t-test, using upstream and downstream concentrations for any one sampling period as pairs. Also, the following statement, "Thus, except for tritium, these data do not show any significant adverse impact on overall river-water quality that can be attributed to Hanford Site operations at this time", is overstated and inappropriate, as the downstream sampling site is 30 miles downstream of the contaminant sources.

11. In several places, the report states that significant adverse impacts have not occurred to the Hanford Reach ecosystem (page 38, last sentence; page 41, paragraph 6, 3rd sentence; page 81, paragraphs 5 and 6; and others). However, the review of ecological studies did not include review of any impact studies. The USFWS interpret impacts to refer to measures of biological effects such as toxicity in bioassays, chromosome aberrations, changes in fish populations or age class structure, elevated incidence of lesions, disruption of enzyme systems, and other measures. Measuring concentrations of contaminants in tissues alone does not allow for the interpretation of impacts unless laboratory exposure studies are available to assist in interpretation. The report did not indicate that these types of comparisons had been made. Unless the above mentioned types of studies have been conducted, statements to the effect that impacts have not occurred are incorrect.

12. With the exception of NO3, the contaminants of concern will tend to partition to sediment, yet discussions of contaminant fate and transport and risk assessments, at most, only touched on the subject of sediment as a component of contaminant ecology. This subject should be given stronger emphasis throughout the document. It is likely that aquatic biota are receiving greater contaminant exposure from sediment than surface water for the following reasons: 1) contaminants are partitioning into sediment, 2) contaminant concentrations in sediment are much higher than in surface water, and 3) because the high water flow rates do not allow development of a major plankton food base, the Hanford Reach food chain is based upon substrate-associated productivity.

13. In Section 3.3.3 Biological Transport, the report focuses on the transport of groundwater contaminants of concern, namely hexavalent chromium, nitrate, tritium, strontium-90, technetium-99, and total uranium to the river water column where fish can ingest the contaminants. The bioconcentration factor developed is assumed to be directly proportional to the concentration of the contaminant in the water column. The assumption that the bioconcentration factor is directly proportional to contaminant concentrations in the water column does not take into account the effect of food chain interactions from sediments or the water column through benthic organisms, plankton, aquatic plants, aquatic invertebrates, and forage fish up to predatory fish species. The USFWS recommends that the bioconcentration factor be reevaluated based upon the Columbia River food chain. Any subsequent impact evaluations in the report are flawed either for Human Health Evaluation, Section 4.1 or Environmental Evaluation, Section 4.2.

14. The USFWS strongly disagrees with the assertion on pages 41 and 79 that sediment contaminant assessment methodologies do not exist, and find it interesting that a reference to Adams et al. (1992) is used to support this point. Adams et al. (1992) reviewed the available assessment methodologies and discussed the extent to which the methods have been validated. The USFWS endorses the proposed investigations designed to examine sediment issues in more detail.

15. The USFWS contends that the conclusions draw from Section 4.2 Environmental Evaluation, are not valid and recommends that they should be removed from the document. The environmental evaluation was based only on exposure of biota to surface water contaminants. Among the potential exposure pathways, which include surface water, sediment, interstitial water, and food chain, the surface water pathway probably has the lowest and most dilute contaminant concentrations and the least impact to Hanford Reach aquatic biota.

16. The additional activities outlined on page 84 will provide much needed information for future impact assessment. The following recommendations are provided for additional activities to further

define biological impacts and include sediment toxicity methodologies. The recommendations are provided without knowing whether these types of studies have been conducted previously at Hanford.

Activity 1A-3. Suspended sediment is an important contaminant transport mechanism. It is not clear from descriptions of previous surface water studies whether contaminants were dissolved or partitioned to suspended sediment, or whether any distinction was made. If partitioning of contaminants to suspended sediment has not been previously addressed, it should be included in this activity. Bioassays to determine impacts of ambient sediment conditions should be conducted on whole sediment and interstitial water in conjunction with chemical analysis. Bioassays should include a variety of organisms and both lethal and sublethal endpoints. Chemical concentrations should be compared to appropriate criteria. The USFWS strongly recommends that additional sampling be conducted on salmon spawning areas. Development of a specific bioassay to assess effects to eggs and fry may be appropriate.

Activity 4-1. Information on uptake and elimination rates will be very useful in determining potential impacts to nonresident species such as those which migrate through the Hanford Reach or are only present during overwintering or nesting periods.

Activity 4-2. The USFWS recommends the objectives be expanded to include determination of potential impacts to benthic invertebrate communities by comparing community characteristics such as abundance, diversity, and species composition with upstream reference sites. The bioassays and invertebrate community structure studies will assist in defining biological impacts associated with contaminant exposure. Because carcinogenicity is a concern with these contaminants, an additional biological impact study based on histopathological examination of fish is recommended to determine potential chronic impacts to fish health. For all studies, care needs to be taken in identifying reference sites.

Activity 4-3. The USFWS recommends that the short-faced lanx (Fisherola nuttalli) and Columbia pebble snail (Fluminicola columbianus) be included in this activity.

17. Page 5, paragraph 4, 1st sentence. The term "shrub-steppe grassland community" should be changed to "shrub-steppe community."

18. Page 8, paragraph 2, 2nd sentence. The character of Hanford Reach is unaltered in that it is still free-flowing, however, it has been altered greatly by control of flows by the Priest Rapids Dam and other dams upstream. For example, riparian vegetation is much more extensive relative to pre-dam conditions. You may wish to mention in this paragraph that although adjacent shrub-steppe

habitats are not considered, diversity is enhanced by proximity to the river.

19. Page 8, Section 2.1.4.1. This section or Section 2.1.4.2 needs to include information on the extensive use of the river by waterfowl for migration stopover and overwintering and by a variety of piscivorous birds. The islands are used for nesting of waterfowl and several species of colonial nesters. Consider adding information on zooplankton to complete this section.

20. Page 8, paragraph 5, 3rd sentence. Recommend changing the term "immature aquatic insects" to "invertebrates" as non-insect invertebrates such as snails and crayfish may be important components of the aquatic system.

21. Page 9, paragraph 3, last sentence. Change panfish to "sunfish", as it is a more biologically correct term.

22. Page 9, paragraph 4, 3rd sentence. This sentence is misleading, since the extensive tracts are irrigated by water from the Grand Coulee Dam rather than the Hanford Reach.

23. Page 10, paragraph 5, 3rd sentence. The pelican is properly referred to as the American white pelican. This paragraph is misleading as several other State and Federal threatened and endangered listed species not mentioned here, also occur. Inclusion of a full list of State and Federal threatened and endangered species in an appendix is recommended.

24. Page 12, paragraph 2. In addition to skyshine, other sources of environmental contamination should be listed, including deposition of contaminated dust, former atmospheric releases from Hanford, and erosion of bank soils likely to be contaminated by association with contaminated groundwater.

25. Page 12, paragraph 3, last two sentences. The terms "eventually" and "have the potential" are misleading since the contaminants have clearly reached the river.

26. Page 12, paragraph 4, 1st sentence. The term "ambient water quality criteria" should be changed to "freshwater chronic criteria" since this is what is used in the rest of the document.

27. Page 12, paragraph 6, 1st sentence. Table 2-1 as described here, was not included in the document.

28. Page 24, 3rd paragraph. Include the location of the U.S. Geological Survey monitoring station.

29. Page 34, Table 2-7. This information would be more valuable and easier to evaluate if data on sample size, sediment grain size, and total organic carbon were included.

30. Page 35, paragraph 2, last sentence. Reference site information may be available from other state or federal studies conducted upstream of Hanford. There are abundant available data in the current scientific literature, toxic chemical databases and from the Environmental Protection Agency and state environmental quality divisions and departments to evaluate if the metals measured are elevated above background. At a minimum, metal concentrations can be compared to those of western soils compiled by USGS (Shacklette and Boerngen, 1984).

31. Page 35, paragraph 4, 4th sentence. "...low concentrations of radionuclides". This is low relative to what reference?

32. Page 35, paragraph 4, last sentence. Include bank erosion as another source of uncontaminated sediment.

33. Page 36, last sentence. Reword the sentence as follows: "Thus, the processes associated with food chains appear to result in a biodilution of radionuclide concentrations in animals at higher trophic levels."

34. Page 37, paragraph 1, 2nd sentence. "Results showed that the measurable body burden...". Is there an unmeasurable fraction of fission-produced radionuclides?

35. Page 37, paragraph 3, 2nd sentence. Is it known whether the geese were resident year-round or only on the Hanford Reach during the nesting season?

36. Page 37, paragraph 3, last sentence. Include the mallard tissue type analyzed.

37. Page 37, paragraph 4, 4th sentence. Include the great blue heron tissue type analyzed.

38. Page 37, paragraph 5, 3rd sentence. Were metals concentrations in whitefish elevated relative to nationwide monitoring programs (Schmitt and Brumbaugh, 1990)?

39. Page 39, Section 3.1. Include an additional pathway of "interstitial-water". The interstitial water is the habitat of a significant percentage of the biomass in aquatic systems. The contaminant concentrations in interstitial water are likely to be higher than in surface water and, unlike sediment, can be compared to established water quality criteria. Also consider adding a "suspended sediment" pathway.

40. Page 41, paragraph 2, first and last sentences. Consider replacing "Subsurface seeps and springs..." with "Subsurface groundwater discharge...".

41. Page 41, paragraph 5, last sentence. Consider replacing the last phrase of the sentence with "...and aquatic organism exposure through dermal, respiratory, and dietary pathways".

42. Page 42, paragraph 4, 5th sentence. It is not clear what is meant by "...no measurable influence on fish from radionuclides". The specific endpoints measured in these studies should be identified.

43. Page 50, paragraph 3, 1st sentence. Other large departures of the model from the natural system include: 1) the lack of a variable which represents partitioning of contaminants from water into sediment; and, 2) large variability in measured hydraulic conductivity, which ranged approximately an order of magnitude on either side of the mean (page B-8, paragraph 1, second sentence).

44. Page 50, paragraph 5. The information in Figure 3-5 and the text do not match.

45. Page 57, paragraph 2, 1st sentence. Change the text to "...where fish are exposed to contaminants...", as other exposure routes in addition to ingestion can occur.

46. Page 59, paragraph 3, last sentence. Only four radioactive contaminants were listed below.

47. Page 64, paragraph 2. Information on the location of the upstream collection site for fish was not included. If the collection site was downstream of Priest Rapids Dam, subtraction of upstream concentration from downstream concentrations does not seem appropriate. The second sentence is confusing and needs clarification.

48. Page 70, paragraph 2, last sentence. After reviewing the wide variety of carcinogenic and noncarcinogenic impacts associated with chromium exposure to mammals presented by Eisler (1986), we feel that this sentence needs to be documented.

49. Page 71, paragraph 5, last sentence. This seems to be a rather circular argument.

50. Page 74, paragraph 2, 1st sentence. The USFWS strongly disagree with this statement and contend that the sediment and interstitial water pathways are the most significant exposure pathways to Hanford Reach biota.

51. Page 74, paragraph 4. The implicit assumption is that the primary environmental receptors are fish. Aquatic plants and invertebrates have limited or no mobility and, as part of the food web, should be included in the environmental evaluation.

52. Page 75, paragraph 4, paragraph 3. These acronyms are not defined.

53. Page 76, paragraph 4, last sentence; page 81, last paragraph. As this ecotoxicity assessment included only exposure of nonhuman receptors from surface water and did not include possible exposure to contaminated sediment or food sources, this

conclusion is not appropriate and should be removed from the document.

54. Page 81, paragraph 2, last sentence. Include the short-faced lanx and Columbia pebble snail in this section. Although they are candidate species, their aquatic/benthic habitat puts them at greater risk of exposure than the species listed here.

55. Page 84, 3rd bullet. As written, this item focuses on the extent to which contaminants will end up in the water column. It should be revised to give equal emphasis to groundwater contaminant partitioning into sediment, interstitial water, and surface water as described in the text of Activity 1A-3.

56. Page 84, 5th bullet. A reconnaissance level contaminant/water quality study was conducted in 1992 on the Columbia Basin Project irrigation drainwater. This study was conducted by the U.S. Geological Survey and U.S. Fish and Wildlife Service under the U.S. Department of Interior, National Irrigation Water Quality Program. The draft report, titled Reconnaissance Investigation of Water Quality, Bottom Sediment, and Biota Associated with Irrigation Drainage in the Columbia Basin Irrigation Project, Washington 1991-93 (Embrey et al. in preparation) is currently in review. Contact Sandra Embrey, USGS, Tacoma, at 206-593-6510 for further information.

57. Page 84, Surface water pathway objectives. Gas supersaturation of water is a problem at some dams on the Columbia River. Evaluation of this potential impact at the Priest Rapids Dam should be addressed.

58. Page 87, paragraph 1, last sentence. A specific statement the "water quality standards applied to interstitial water will be protective of the environment" needs to be made.

59. Page 88, paragraph 6, last sentence. Please add "permitted and nonpermitted point sources" to this list.

60. Appendix B. The information presented here was difficult to interpret due to inconsistent presentation of ground water elevations. For example, some figures showed ground water elevation relative to sea level, text information provided ground water elevation relative to surface level, and Figure B-1 did not include elevations at all. A table with data on well screen depths, the number of times wells were tested, and the constituents analyzed should be included.

61. Page B-8, paragraph 1, 2nd sentence. Using a mean hydraulic conductivity based on such large variability will result in discharge estimates with large confidence intervals. Please note this source of error where mean hydraulic conductivity is used in other equations or models.

62. The inclusion of four areas of the Hanford Site on the EPA's National Priorities List under CERCLA indicates the importance of the CRIEP to cleanup actions in this reach of the Columbia River. The limited time frame initially provided for public comment, did not allow the USFWS sufficient opportunity to provide this plan to USFWS research and development staff with expertise in hazardous materials. The USFWS recommends that the Tri-Party Agencies prepare an environmental impact statement for this plan and submit it for public review in accordance with the provisions of the NEPA as provided in Section 1502.18.(d) for circulation of environmental statements.

63. Many issues of the CRIEP involve radiological contamination and health effects. Because the DOH is the state radiation regulatory agency, including environmental radioactivity, DOH involvement in these plans is essential. Appropriate participation includes developing cleanup plans, measuring environmental radioactivity, interpreting data, evaluating radiation risk, and assessing cleanup effectiveness.

64. The Environmental Radiation Section of the DOH is responsible for environmental radiation monitoring and protection statewide. For more than two decades the Section has been monitoring environmental radioactivity in the vicinity of the Hanford reservation. Since 1985 the Section's Hanford Environmental Oversight Program has participated with DOE in the collection of environmental media on or near the Hanford Reservation. This participation has included side-by-side monitoring, split sampling and/or independent monitoring for all facilities and projects having a potential environmental or public health impact. This program can be easily extended to satisfy quality assurance aspects of the monitoring needs of CRIEP.

65. The DOH concurs that sampling proposed by the CRIEP should be conducted by existing site monitoring programs within "that segment of the river bounded by Priest Rapids Dam down to the head of Lake Wallula". This area, in its current configuration, does not pose any immediate threat to the public or the environment. This conclusion is supported by our monitoring data and by the "impact evaluation" (Chapter 4) presented in the CRIEP.

66. While it may be justifiable to extend the downstream boundary to include McNary pool, in our opinion further extension of the downstream boundary cannot be justified on radiological grounds. Results from numerous special investigations and state and federal monitoring programs have conclusively shown that levels of Hanford-origin radioactivity in Columbia River sediments downstream from McNary are barely measurable and well below levels that would be a cause of concern for human or ecological health. These results will be summarized in a new DOH report to be publicly released in September, 1993: "Columbia River Sediment Study: Past, Present and Future".

67. Page 4, "1.3 Relevant Environmental Statutes...". R.C.W. 70.98 authorizing the DOH as the state radiation regulatory agency, including environmental radiation, is clearly "applicable, relevant and appropriate".

68. Page 12, paragraph 2. "Shine" is a phenomena resulting from nuclear and electron Compton scattering of high energy photons (approximately 1 MeV). Reflection/refraction from dust and clouds results from scattering low energy photons (approximately 1 eV) from molecular lattices. These two phenomena are physically distinct. However, this comment only affects the technical accuracy of the document and not its impact or conclusions.

69. Page 36, 4th paragraph. Discrete particles of radioactivity, including machine components swept downstream, is a very difficult form of contamination to locate or monitor and therefore difficult to remediate. Nevertheless, these issues do not seem to be addressed in the CRIEP. It is essential to address this issue before, in the "recreational scenario", a beachcomber picks up highly radioactive material.

70. Pages 62,63 and 73. The DOH agrees that most of the assumptions of the CRIEP are conservative and probably result in conservative risk assessments. However, several assumptions in the CRIEP appear to be non-conservative that are not so recognized. For example, the assertion on page 62 that "sediments tend to wash off" is directly contradicted by the common experience that beach sand (sediments) sticks to clothing, shoes, towels and sporting goods. Similarly, the recreational scenario of 1 day/year on page 63 seems more of an average number, rather than representing the boater who loves to fish every weekend. Finally, the argument on page 73 that "EPA radionuclides slope factors are likely to represent an upper bound estimate of the carcinogenic potential..." is extremely weak. In fact, as noted in that paragraph, the worlds data is also consistent with the risk being three times higher than current EPA slope factors.

71. Page 86, Activity 1A-1 - Identification of Contaminants of Potential Concern. The DOH is concerned that radiological contaminants are being identified without the DOH's participation. In particular, the DOH would like to see included in this report an evaluation of the human health impact of radiological contaminants in sediments. Contaminants of potential concern include, but are not limited to, the isotopes already considered in the CRIEP as well as isotopes of plutonium, europium, cesium-137 and cobalt-60.

72. Page 86, Activity 1A-2 - Characterization of Contaminant Fluxes. The DOH maintains great interest in these groundwater investigations planned for 100 Area Operable Units. The DOH should receive a summary report of the information collected under this activity.

73. Page 86, Activity 1A-3 - Characterization of Contaminant Mixing in Discharge Zones. The DOH believes that understanding contaminant mixing is essential for realistic risk calculations. Thus, the result of this study are of great interest to the DOH and the DOH should be kept apprised of results of these investigations.

74. Page 88, Activity 1B-1 - Identification of Other Contaminant Input Sources. Should compilation of existing information prove inadequate to characterize other contaminant sources of radioactivity, thereby initiating a new sampling program, the DOH proposes some split sampling activities for quality assurance purposes. The DOH should receive a summary report of the information compiled under the activity.

75. Page 89, Activity 2-1 - Surface Water Monitoring. Active participation in the radiological portion of this sampling activity by the DOH would lend greater credibility to the final conclusions as well as partially satisfy the DOH's statutory requirements for environmental radiological monitoring of the Hanford site.

76. Page 91, Activity 3-1 - River Sediment Monitoring. The DOH should actively participate in the radiological part of this activity. DOH participation could include split samples, joint planning and execution of sampling activities, and comparison of results.

The DOH should be consulted regarding the process of developing sediment quality criteria for the investigation of radiological contaminants.

77. Page 92, Activity 4-1 - Compilation of Ecotoxicological Data. The DOH maintains a keen interest in the radiological aspects of this activity and should receive a summary report of this information.

78. Page 92, Activity 4-2 - Compilation of Biocontaminant Monitoring Data. The DOH is potentially interested in splitting samples with this program and monitoring the progress of these activities. The DOH should receive a summary report of this data and actively participate with assessing environmental and human impacts.

79. Page 92, Activity 4-3 - Compilation of Sensitive and Critical Habitat Information. The DOH should be kept informed of these activities as they progress and receive a summary report of this information.

80. Page 93, Activity 4-4 - Data Evaluation
The DOH should actively participate with the evaluation of all radiological data and those decisions made regarding project changes. Data quality issues will be partially addressed by intercomparisons between the DOH's data and DOE contractor data. An active participation of the DOH regarding quality assurance

and statistical protocols would enhance the quality of the final product.

81. The selection of environmental endpoints is heavily biased towards receptors that traditionally have been selected either because they have a potential impact on human health (i.e., they are part of a biotic pathway for human exposure) or because they have created localized problems by their ability to intrude into waste sites. Thus, Section 3.1.4 of the CRIEP states that fish will be used as a measurement endpoint, not only to evaluate human exposure but also to evaluate environmental impacts.

82. We acknowledge that Hanford has added additional species to evaluate impacts to environmental receptors independent of the human pathway (Steve Friant, personal communication with John Hall of the Washington Department of Wildlife). Moreover, it only makes sense to start with existing data bases to evaluate potential environmental indicators or receptors of concern. Our concern, however, is that by relying too heavily on existing data bases and biases for selection criteria we will ignore those groups of organisms that are sensitive to environmental contaminants and for which we have a poor knowledge of their distribution and abundance.

83. In relation to the CRIEP it is insufficient to only assess the impact to fish. Ecology's earlier comments on a draft of this document have already pointed out the shortcomings of relying on a mobile indicator species (see comment number 89 on Section 4.2 of the CRIEP). Moreover, reliance on only fish as an environmental endpoint ignores the impact to the riparian zone species that are independent of food webs involving fish. Within the context of a Qualitative Risk Assessment (QRA) evaluating fish may be sufficient; however, this narrow focus should be viewed as insufficient for a baseline risk assessment. In their disposition of Ecology's comments to the draft CRIEP (Goller 1992) DOE/RL indicated that the CRIEP represents a plan for gathering the necessary additional information necessary to construct a baseline risk assessment for the 100 Area. (We understand that the scope of this effort may have changed to something even broader by now.) Thus, the proposed data collection plan (Section 5.0) should identify data gaps and propose possible additional environmental endpoints. This section of the CRIEP is insufficient on both accounts.

84. Because my staff has some experience with amphibians, I will use them as an example of a riparian zone indicator species to illustrate our argument. Other groups of organisms, such as butterflies and lizards, may be important in other contexts (unrelated to the Columbia River) because of sensitivity to environmental perturbations or place in the food chain; however, we mention them here only to illustrate there may be other groups of organisms that have been ignored because they have not been the focus of past data collection. Besides the rationale I mentioned previously for environmental endpoints, past data

collection efforts on species' distribution, abundance, and ecological tolerance may have been skewed toward those organisms considered of interest to humans and not necessarily toward those species (and habitats) that may be the most ecologically sensitive.

85. The HSBRAM provides guidance on identification of habitats of potential concern and the identification of environmental assessment and measurement endpoints. The use of indicator species is described as a means to support the assessment process. Only in the broadest sense has the habitat necessary for the maintenance of amphibian populations on Hanford been identified (for now this refers only to riparian habitat where reproduction and larval development take place), yet amphibians qualify as both detector and bioassay species (HSBRAM, page 69).

86. Amphibians can be important monitors of environmental quality and are of current worldwide concern because of seemingly widespread declines in numbers (Blaustein and Wake 1990). Because of their biphasic life-cycle (aquatic larvae and terrestrial adult) amphibians are exposed to contaminants from all three media. Moreover, their highly permeable skin is highly susceptible to skin absorption of contaminants. Each stage of their lives: egg, larval, juvenile, and adult is useful in bioassays (Devillers and Exbrayat 1992).

As pointed out by Fitzner and Gray (1991) the distribution and abundance of amphibians (and reptiles) on the Hanford Site is poorly understood (though the manuscript identified three amphibians as common in riparian areas). Current literature even indicates a lack of agreement on definitive species lists for the Site (e.g., Gray and Rickard 1989; Fitzner and Gray 1991). From a position of relative ignorance it is hard to reconcile statements such as: "No studies have been conducted on the abundance and distribution of reptiles and amphibians on the Hanford Site, and no specific data exist for the peninsula between the 100-D and 100-H Areas." (DOE-RL 1992, page 2-24) with statements such as: "Because of their low numbers [reptiles and amphibians] and because they are not in a direct pathway to humans, they are not considered further here." (Weiss and Mitchell 1992, page 25). Both of these latter documents provide support information for the CRIEP. In summary, and using only amphibians as an example, **the Washington State Department of Wildlife conclude that the proposed data collection plan of the CRIEP inadequately evaluates ecological data gaps and may fail to identify additional and appropriate environmental endpoints and bioassay data.**

87. Section 2.1.4.2 Riparian Zone, page 10, last paragraph of section: The great blue heron is not a candidate species for listing. It is currently identified as a state monitor species. (As an example of bias note that in the preceding paragraph in which it is mentioned that many invertebrates, birds, reptiles, amphibians, and mammals use the riparian zone, only birds and mammals are listed as examples.)

88. Section 3.1.4 Biotic Pathways, last paragraph: This paragraph, in essence, only evaluates the potential impact to critical habitats necessary for endangered or threatened species and does not the evaluate the full range of sensitive habitats identified by 40 CFR Part 300, Appendix A, Table 4-23. The second sentence of this paragraph should clarify that bald eagles are federally and state listed as threatened; whereas, the American white pelican is only state listed as endangered. Finally, the assessment of impact to the white pelican is incomplete. First, chemical contaminants are not assessed. Second, can Becker's (1990; referenced in the last paragraph on page 36 of the CRIEP) generic statement related to a dilution of radionuclide concentrations at the higher trophic levels be used to assume bioaccumulation of contaminants does not occur in the white pelican?

89. Section 4.2 Environmental Evaluation, 2nd paragraph: As pointed out by Ecology's earlier comments on a draft of this document, the use of a mobile receptor species may inadequately serve to assess impacts to sensitive members of the biotic community. Amphibians breed in the sloughs and slack-water areas of the Hanford Reach and the larvae tend to remain near the area in which they hatched. Thus, they are inadequately modeled by a mobile organism. They are potentially exposed to much higher concentration of contaminants than a free-swimming fish.

90. Section 5.1 Columbia River Impact Evaluation Summary, 3rd paragraph, 2nd bullet: The statement: "Threatened and endangered species continue to use the Reach for Habitat." is meaningless. The bald eagle and American white pelican are insufficient monitors of the functional integrity of the Hanford Reach ecosystem. Eagles are dependent on a human supplied resource (i.e., planted trees) and neither species has an established breeding population on the reach. Although listed species are of concern, they do not necessarily reflect the integrity of an ecosystem. Other factors may play a role in their decline. The status of year-round resident species that were at one point common may provide a better assessment of ecosystem health. Again, the bias in data gathering may have prevented us from observing whether certain groups of organisms have been adversely impacted by contaminant releases.

91. Section 5.2.2.4 Task 4 - Characterization of Biological Pathways:
- 1st paragraph on page 91: The statement that, "...there are relatively few data needs required to allow for a cumulative impact assessment." is not correct for the many reasons stated.
- Activity 4-1 - Compilation of Ecotoxicological Data: No mention is made of the need for additional bioassay data should there be a determination that adding indicator species is necessary; i.e., there seems to be no intent to go beyond the mobile fish model as an indicator species even for the baseline risk assessment.
- Activities 4-2 and 4-3 (Compilation of Biocontaminant Monitoring Data and Compilation of Sensitive and Critical Habitat

Information, respectively): These two activities exemplify the bias in relying strictly on historical data and emphasizing those organisms that could be part of the human food chain. These activities should evaluate whether organisms that have been poorly studied require an evaluation of their population status and their susceptibility to contaminants.

92. Although the CRIEP may suffice as a QRA for evaluating the impacts of the 100 Area on the Columbia River it does not adequately address the ecological data required to construct a baseline risk assessment. It seems to rely on the unsupported supposition that almost all ecological data needs have already been met. This assumption must be critically analyzed.

93. The scope of the impact evaluation should include consideration of all sources of pollution to the Columbia River, not just those that result from past and present 100 Area operation as suggested in Section 1.2 of the proposed plan. Contaminants from other operations at Hanford have and continue to contaminate the river and should be considered in a comprehensive plan.

94. The scope of planning should include the effects on sediments downstream from sources on contamination, including sediments behind dams.

95. The CRIEP seems to disregard the presence on iodine-129 as a potential contaminant. In general if technetium-99 is observed or monitoring planned, investigation for iodine-129 should also be accomplished, since these two isotopes are highly soluble fission products and are usually found together in ground water, unless there is a specific reason they did not exist together in the source of the contamination.

Iodine is also concentrated in fish by about a factor of 1000 over the concentration in the water in which they live. This concentration effect should be considered in the subject monitoring plan with specific evaluation of fish. Fresh water clams and mussels may also concentrate iodine. Thus, they also should be considered in the CRIEP.

96. Neptunium-237 and Neptunium-239 are particularly mobile and trouble-some isotopes. The CRIEP should explain why these isotopes are not being monitored at Hanford. For example, see Tables 2-3 and 2-4 for omission of consideration of Neptunium-239 or Neptunium-237.

97. A Hanford Reach Contaminant Transport Model is described in Section 3.3.2 of the CRIEP. Validation for this model should also be presented in the CRIEP. Data collected by Hanford in the early days of operations should be utilized to accomplish this validation. In particular, values of contamination in fish compared to the river water and sediment contamination should be considered as well as the measured dilution of isotopes with distance from source during these early operations.

It would appear that a model that more properly considers the gradual slopping of the river bottom from the shore with the lower water velocities near the shore line and in back water locations should be assessed to provide a basis for contamination transport. It would appear that the model described can not assess the limiting conditions in the river where contaminants could accumulate from particulate transport. Bottom feeding fish such as sturgeon should be assessed relative to the accumulation of contaminants distributed by particulate transport.

98. The CRIEP states that eight (8) reactors were constructed to allow direct contact between the reactor cores and the cooling water of the river up until 1986. And within the same paragraph, it states that direct-contact, single-pass reactors ceased operations in 1971. The plan is vague about when the direct contact between the cores and once through river water ceased.

99. Figures 2-4 indicates that tritium is not a factor in the "100 K" area. Yet the statistics on the "Estimated Contaminant Fluxes and Concentrations" show otherwise. Tritium may be originating from the 100K area. This source of tritium should be reconsidered in the plan.

100. The HSBRAM should not be used. This risk assessment does not properly consider cultural foods and habits of the Yakima Nation people.

101. The CRIEP should state how charts 2-6 and 2-7 came up with the figures of contamination. Any source of contamination upstream would originate from the 100 area. Unless the nitrate, tritium, uranium, technetium and other contaminants are coming from independent sources other than Hanford. Otherwise the model should use the Snake River for comparison where there is more control. In particular, the source of tritium and technetium in the Columbia above Hanford should be identified and compared with other surface water not associated with Hanford to validate assumptions about the "background" levels of these contaminants.

102. The CRIEP states that there is no evidence of past or present significant ecological impacts associated with contaminated sediments; but yet, in the same paragraph states river sediments are known to be contaminated. This should be clarified.

103. The CRIEP states that human ingestion is the most significant biotic pathway. The CRIEP should consider the cumulative effects of fish consumption by the indigenous people whose main staple is fish. Indigenous people along the Columbia River may consume up to 40 time as much fish as the average non-indigenous person.

104. Maximum contaminant levels as proposed in 56 FR 33050 should not be used if it has not been made a binding regulation of clean up. 40 CFR 300.430(e)(2)(i)(A)(2) should continue to be used as the baseline until superseded.

105. The CRIEP states ..."upstream concentrations of carcinogenic contaminants (i.e. radio nuclides) are subtracted from the average river concentrations or concentrations at the City of Richland water intake prior to calculating intake values". This would reduce the total content of contaminants. It should not matter whether the contaminants are coming from the Hanford area or not, the total amount of contaminants and their effects are the critical factors to be considered. If the total effects were unacceptable, then the impacts of the Hanford contaminants would be significant in any case.

106. The CRIEP mentions Yttrium-90 and Barium-137 but does not describe the source of these isotopes nor their undesirability. The CRIEP should state the effects of those elements on the ecosystem and biota.

107. The CRIEP states that the drinking water of Richland is "treated" and therefore, concentrations of many contaminants would decrease. But the CRIEP does not state whether the water is treated for tritium, uranium, nitrates, etc. Contaminants for which treatment is effective should be identified.

108. Integrated surveys should be used to determine the cumulative effect on human exposure to contamination and not limit it to inhalation, ingestion of fish, and water. For example, irrigation using river water, pasturing of livestock, consumption of wild waterfowl, gathering of roots, plants and berries, hunting of wild game, etc., should be considered as potential pathways. Note that irrigation water from a point near the 300 area is currently being accomplished.

109. The characterization of contaminant mixing in discharge zones should in addition to the use of 100D-1 as an example, use the 100K-1 and 100N-1 sources based upon the content and volume of contamination seeping into the Columbia River.

110. It will be useful to see an emphasis on nonradiological contamination present in the Columbia River, resulting from Hanford activities. The literature to date is underdeveloped in this aspect of potential contamination of the Columbia River.

111. More information is needed regarding the surface water model which is being used. However, it appears from the discussion that the model selected is too simplistic to provide meaningful and reliable results. It is understood that the surface water model is theoretical and in the formative stage, but it might be necessary to refine it to account for the complexities of the actual, natural river system. In order to be a valid predictive tool, the model must be verified using actual data.

112. The emphasis of the CRIEP is the impact of the 100 Area on the river. However, it should be stated early and distinctly in the plan that the other NPL areas, most importantly the 200 and 300 Areas, have the potential to significantly impact the river. The

study should be conducted to account for the possible effects of contaminants released from these areas.

113. It is imperative that the public be brought into the process to the greatest extent possible so that concerns can be addressed early on and so that the public is given the greatest opportunity to "buy-in" to the project.

114. Identification of the groundwater contaminant sources and specific contaminants emanating from each will be valuable in assessing the potential public health impacts on the river.

115. An evaluation of the speciation of chromium is necessary in that there is a significant difference in public health effects of trivalent and hexavalent chromium. The primary difference between the two species is that hexavalent chromium has been classified as a known human carcinogen (EPA class A) through inhalation, while the trivalent species has not been so designated.

116. An evaluation of the public health effects of contaminants present in the corrosion products within the reactor outfall lines must be made, particularly the introduction of scales or pipeline "sediment" into the river during decommissioning and/or removal.

117. Specific evaluation is necessary concerning the public health effect of crops irrigated with river water. Results in the DOE annual environmental reports suggest that no significant impact have occurred or are occurring. Nevertheless, a specific evaluation is necessary for the public health effect of human consumption of irrigated crops, relative to the reported contaminant concentrations in the river water. This evaluation would be useful in informing the public on the specifics in this issue.

118. Specific evaluation must be made of the human health effects of contamination entering the river environment from seeps, particularly the "N-springs" and "Hanford Reach Mile (HRM) 28" springs/seeps. These areas both have elevated levels of radionuclide contamination. Definitive statements need to be made addressing the level of threat and the remedial requirements for these areas.

119. In the evaluation on the effect on the biota, care should be taken to address the concerns of Native Americans. The wider use of the living natural resources by Native Americans could result in exposure to biological pathways not a consideration in Non-Native American cultures.

120. The Columbia River and the health of the public using it are in serious jeopardy from past and present Hanford operations. The threat is not only from the flow on contaminated groundwater into the River, but, from: radioactive "shine" exposing users of the

Columbia River and shoreline near reactors, cribs and basins; leaching of contaminants, including mercury, from old reactor discharge and pipes and other facilities; contaminated shoreline and island sediments/beaches, including flakes of radioactive material from old reactor piping and "chips" of irradiated reactor fuel and fuel cladding washed into the River when the "once through reactors" operated. (It was known 30 years ago to cause "significant" public radiation exposures to users of the Columbia River islands and beaches. But, the documents were classified while the public was encouraged to use the Hanford Reach of the Columbia River.)

The CRIEP does not address the threats in comment 119. In fact, this document fails to address the known contamination, from numerous operations and contaminants, of the groundwater. Despite numerous reports and existing data required to be collected by federal and state law (ie RCRA and RCW 70.105) on contaminants known to either be impacting the River, or threatening the River, the CRIEP ignores all data except that regarding six contaminants of concern. In this regard, one can only reach the conclusion that this document was prepared solely with a public relations goal in mind; and, either incompetently, or as part of a willful cover-up, failed to even include known contaminant data; estimates of health risks to children utilizing the Hanford Reach for recreation; data on potential for irrigated crop contamination; information of a definitive health risk to Hanford Reach users from radioactive "shine" -- to name just a few of the shortfalls of this study.

121. Amazingly, the CRIEP failed to disclose and discuss known contamination and exposure threats which have been ranked by regulators as serious enough to warrant listing as CERCLA Expedited Response Action sites. E.G.: The CRIEP fails to disclose or discuss mercury as a "contaminant of concern" despite listing it in document WHC-SD-EN-TI-037 as a "contaminant of concern" due to known spills and disposal via 100-D/DR area pipelines to the River, with the likelihood of continuing releases to the environment.

122. Perhaps the most incredible aspect of DOE's CRIEP is the use of a model to assess and quantify health risks to River users which deliberately excluded ALL CHILDREN and teenagers from its recreational exposure scenario:

> "the recreational scenario assumes that adults are the only receptor population and that young children do not need to be evaluated for this scenario" CRIEP, page 72.

123. The CRIEP's usefulness is further destroyed (beyond the selective use of data and use of a model that excluded children) by being based upon four year old data ["Hanford Site Groundwater Monitoring for 1989"] which is known to exclude RCRA Groundwater Monitoring Reports that include monitoring data on far more contaminants, and which reveal far greater concentrations of contaminants moving more quickly to the River.

124. The CRIEP, therefore, must be rejected by EPA and Ecology as totally inadequate and deliberately misleading. Thus, because the production of this plan was an important milestone of the Tri-Party Agreement (and frequently proffered to concerned citizens as the future basis for decisions on protection/usage of the Columbia River) the DOE (and its contractors) should be assessed a serious fine for failing to produce a report meeting the milestone and the requirements of CERCLA and MTCA. This penalty should be set sufficiently high so that the contractor who produced this report pays entirely for the regulators to procure a qualified independent assessment of impacts to the River and potential health threats.

125. At this time, the DOE should also be required to consider the Columbia River Shoreline as the location for assessing annual exposure to the potentially maximally exposed member of the public. It is abundantly clear that the shoreline is the point of uncontrolled public use where public exposures and risks are greatest. This would mean abandoning the artificial claim that the maximally exposed individual is a resident living outside the official site boundary. Radioactive "shine" alone would expose the hypothetical public user/resident (remember Native Americans have an enforceable treaty right to live along the public access shoreline incident to exercising fishing rights) to an increase in radioactive exposure up to 800 percent above the EPA's legal limit for exposure of the public to radiation from all nuclear fuel cycle source (25 millirem per year), and this increase is just an average for certain shoreline areas -- some areas would yield that dose in four weeks of exposure. Averaged over an entire section of Hanford Reach shoreline (i.e., the 100-K and 100-N Areas), annual exposures may range over 300 millirem -- approximately three time the exposure for non-hanford shorelines. This would <u>conservatively</u> cause an expected additional eight fatal cancers per year per 10,000 population exposed.

Contrast this conservative estimate of potential impact from use of the Columbia River at Hanford with the claimed no significant impact in the DOE CRIEP. Yet, data on shoreline exposure levels are DOE's own data.

126. There is no conceivable explanation for why the DOE's CRIEP excluded consideration of the health impacts of radioactive "shine" from Hanford facilities while claiming to assess Hanford's potential impact on the River and public users of the River.

127. Any new study must also consider the impacts of continued liquid waste discharges in terms of both increased contaminant load on the vadose zone and groundwater and the flushing of contaminants into groundwater and the River. A new study must also use data from RCRA groundwater monitoring programs -- which reveal greater contaminant concentrations than this report -- and an independent, credible assessment of health impacts from hazardous and carcinogenic groundwater contaminants.

128. Since 1943 the Hanford Nuclear reservation has been polluting the local and regional environment with radioisotopes, metal and chemical contaminants. Columbia River United hoped the CRIEP would honestly address the actual impact of fifty years of unsound environmental practices on the Columbia River ecosystem. After reviewing this document, Columbia River United must reject it as totally unsatisfactory as the found it to be only a White Wash, "Do Not Alarm The Public", everything is "A OK". It is hard to believe that after so much public involvement that the authors of this report actually thought Columbia River United would accept this form of cover up. Putting it directly, this report is a disgrace to god science and the agencies responsible for its production.

129. To begin with, the report does not include all the data that has been gathered for the last 43 years. It does not include all effluents dumped into the Columbia River from all sources, reactors, groundwater seeps, spills, radioactive shine, etc. The study does not address the air emissions being generated from all of the production facilities. It is as though the authors were given limited data and had no background of the past practices of the Hanford Complex, and were asked to put this evaluation together.

130. Page 2, paragraph 3. "In addition, the study extends upstream a sufficient distance to provide appropriate control information for evaluating impacts. The use of sample locations at Priest Rapids Dam or Vernita Bridge as controls assumes that these areas have not been significantly impacted by Hanford air emissions." This assumption is erroneous considering what the two ongoing health studies have shown in reference to fall out from Hanford. Do these researchers truly believe that what came out the stacks at Hanford never came down? Columbia River United recommends that the Brewster/Grand Coulee area is used for a control area.

131. Page 9, paragraph 5. "The Hanford Reach has been designated by the State of Washington as a Class A (Excellent) water body (Chapter 173-201 WAC). Such waters are suitable (and must be maintained suitable) for essentially all uses, including raw drinking water, recreation, and wildlife habitat." By stating this fact the report leads the reader to believe that all water along the Hanford reach is class A Excellent. This is not the truth. There are various areas along the shoreline that if one was to drink the water, they would exceed their maximum lifetime allowable dose. The plan fails to disclose and discuss known contamination and exposure threats which have been ranked by regulators as serious enough to warrant listing as CERCLA, and expedited response action sites. An example is mercury which was listed as "contaminant of concern" , WHC-SD-EN-T1-037. The plan fails to even mention RCRA Groundwater Monitoring Reports.

132. Page 61. One of the most alarming statements in the report was, "the recreational scenario assumes that adults are the only receptor population, and that young children do not need to be

evaluated for this scenario". These assumptions are factually incorrect. Since when has the river been posted for "ADULT USE ONLY"?? Columbia River United believes that the effects of children would change the whole risk assessment and the intent of this report was to show no impact so children could not be considered. Go to any recreational area and you see children.

133. Page 61. The CRIEP completely covers up the facts that there are severe health risks posed to the public at the outfalls, ie. 200,000+(pCi/L) for tritium, 7,279pCi/L for strontium. It does not talk about the exceedingly high exposure from radioactive shine that the public could receive by spending time around the 100-K and 100-N areas and yet in this document they state "no immediate health effect". What about a few years later? The CRIEP states "that river users have limited access to the river bank along the Hanford Site". It's amazing that the authors can state such a fact, when in fact the Hanford shoreline might not be totally accessible in 1993, but all of the islands are, and there has been severe environmental degradation.

134. In 1992, the Hanford Reach was nominated for a Wild and Scenic River designation, which will draw many more river users to the Hanford Reach, resulting in more exposure and more human health impact. The report completely suppresses scientific evidence showing that the Hanford Reach is severely degraded. The report downplays the impact DOE has made on the Hanford Reach for the past 50 years.

135. Page 73. The modeling for the recreational user is based on a one day a year exposure rate for 30 years. This is hardly a realistic number and again shows the blatant effort to reduce the potential human health impact. The authors refer to the cancer rate of x, but yet they never mention other health effects caused from radiation exposure.

136. Page 41. The lack of consideration of the river sediment pathway is very telling as it is the sediment not the water where contaminant problems usually show up. "This does not necessarily mean that significant impacts have not occurred, only that the tools to evaluate impacts are lacking. Consequently, impacts due to river sediments will not be evaluated further in this report." This statement alone should make this report meaningless. Columbia River United recommends that the EPA and Ecology reject the CRIEP. This plan should be an embarrassment to all agencies. It is not scientifically sound and appears to have only been produced to suppress what is known of the true impact to the Columbia River ecosystem. As the production of this plan was an important milestone of the Tri-Party Agreement, DOE and its contractors should be assessed a serious fine for failing to meet a milestone and the requirements of CERCLA and MTCA. The penalty of this fine should be high enough to allow the regulators the procurement of a qualified independent assessment of the Hanford Reach/Columbia River and the true potential human and aquatic

health impacts. This future document should be directed by the new Hanford site specific advisory board.

137. We reviewed the CRIEP, DOE/RL-92-28 Revision 0. We were very disappointed.

138. We doubt the authors intended it, but the choices and assumptions made in the CRIEP seem to minimize the calculated risks at each step. This works against the protection of the public health and the public interest. It is important that this not happen in the implementation of the CRIEP activities. We encourage that outside interested parties (especially opposed parties) be included in all aspects of the implementation of the CRIEP to act as a counter balance against such effects. Our detailed technical comments are attached.

139. The CRIEP is limited solely to meeting milestone M-30-02. This milestone incorporates parts of milestones M-30-01 and M-30-03. These milestones state:

M-30-02 "Submit a plan (primary document) to EPA and Ecology to determine the cumulative health and environmental impacts to the Columbia River, incorporating results obtained under M-30-01."

M-30-01 "Submit a report (secondary document) to EPA and Ecology evaluating the impact to the Columbia River from contaminated springs and seeps as described in operable unit work plans listed in M-30-03."

M-30-03 "Complete all non-intrusive field work as identified in draft work plans for the following OU work plans: 100-HR-1, 100-DR-1, 100-BC-1, 100-BC-5, 100-KR-1, 100-KR-4, 100-NR-1, 100-NR-3, and 100-FR-1."

140. The structure of the CRIEP is difficult to follow. The body of the "plan" is presented in chapter 5. The earlier chapters are dedicated to analysis of prior data. This is confusing. The document would be easier to understand if the "plan" is presented first, with the supporting information identified in separate chapters following the CRIEP.

141. Chapter five is written mostly in third person. The language used is highly tentative. It uses an excessive number of could's, should's and may's. The language of chapter five needs to be in first person direct form. It must specify the work to do, who will do it, and how to fund it.

142. The CRIEP identifies a proposed timeline for the activities in Table 5-1. This should be expanded to include all of the steps and sub-steps of the CRIEP and the responsible party(s) for each. To succeed the CRIEP needs to have defined tasks and goals with definite funding and schedules for completion. As additional

data is collected, these dates and funding may need revision. The CRIEP needs to identify this, and allow for it.

143. Many of the comments below and in our detailed technical comments are also stated in Chapter 5. Throughout our comments, "the CRIEP" refers to the entirety of the document in addition to the items in Chapter 5. The supporting information in the early chapters make several bad assumptions:

1. The CRIEP assumes that carcinogenic and other health impacts from radionuclides are not additive. This is evident from the way the nuclides of concern were chosen. The CRIEP excludes all nuclides which fail to individually exceed a regulatory limit. This neglects the cumulative effect of similar radiation from a variety of radioactive isotopes. Isotopes which behave in a similar manner chemically, and which emit similar radiations can be expected to cause similar damage. Because of this it is not justifiable to neglect each isotope that fails to exceed a regulatory limit prior to the calculation of exposure.

   There is no stated justification for assuming that the effects of radiation exposure from different isotopes are not additive, cumulative or synergistic. Lacking such data, it is important that all exposures be considered. For many isotopes, the exposure will be far below regulatory or health concern. The appropriate place to reach this conclusion and eliminate these is in the conclusions section of the report or plan, rather than in the data collection sections.

   By this, we do not mean to argue that sampling and analysis should be done for all individual isotopes no matter how infinitesimally small the exposure. It is important that the analysis include isotopes whose concentrations are at levels near to, but below the regulatory limits. The amount of money expended should be proportional to the potential risk. For initial analysis, testing for more isotopes is justified based on a lack of information about what may be present.

2. The CRIEP seems to make the implicit assumption that chemicals and nuclides are safe until proven harmful. This has been common practice until recently. It does not ensure that no harm is done, and it tends to minimize the apparent impacts of pollutants prior to determining whether there is a significant hazard or not.

   This is most evident in the discussion of hexavalent chromium. Hexavalent chromium is a known human carcinogen by inhalation. There is not sufficient information to judge its carcinogenic potential by ingestion. On page 70, the CRIEP states flatly that chromium is NOT carcinogenic by

ingestion. This is wrong. Chromium has not been demonstrated to cause cancer by ingestion in humans. This is a far cry from demonstrating that it does NOT cause cancer by this route, especially when it is a known carcinogen via inhalation, a suspected carcinogen by skin contact, a known mutagen by numerous routes, and a known neoplastigen. (Reference: Carcinogenically Active Chemicals, Lewis, 1991)

3. It is evident by the selection criteria (exceeding a regulatory standard) that the CRIEP assumes current standards for protection of health from chemicals and radionuclides are sufficient to guarantee safety. This is untrue. The regulations are based on the same assumption as item two above. They limit exposures to the levels which have not been shown to cause harm. This does not mean that they are harmless below these levels. This basis is very different from standards, such as those produced by the Food and Drug Administration which are usually based on levels which have been shown to be safe. Many of these standards are expected to be revised downward.

4. The CRIEP bases its evaluation of radionuclides on the BIER III information. It should use the BIER IV information. This increases the risk estimate by at least a factor of three. (See second paragraph on page 73. Given the uncertainties in the risk associated with low dose radiation exposure through both direct and indirect paths (e.g. immune system suppression or activation), all risk estimates in the CRIEP should be increased. They should be multiplied by a factor of 3 to account for the BIER IV report data. This is the latest data. Use of the BIER III data underestimates the risk. Even use of the BIER IV data will not a conservative estimate. It will only bring it in line with the most current information.

   Data on health effects of low dose radiation exposure is limited (first sentence on page 73). To be conservative, the risk results based on BIER IV should be multiplied by an additional factor of 10. This additional factor of ten is needed to account for the margin of uncertainty in our knowledge of the effects of low dose radiation exposure as discussed in the CRIEP.

   This yields a total multiplication factor of 30 times the risk estimated by the CRIEP for radionuclides. Because the CRIEP excludes all individual radionuclides that fail to exceed a regulatory limit by themselves (with 1989 data), the risks are potentially even higher than 30 times the risk stated in the CRIEP.

   The use of conservative estimates is necessary. On the other hand, if baseline estimates using the 'best' and most recent available data are not also presented, the study and

plan may over state the risks. It would be reasonable for the CRIEP to contrast a base case using a linear model against a conservative estimate with the additional factor of 10 included.

5. The analytical model of the river used in the CRIEP is grossly different from reality. The river has numerous pools, margin areas, and sloughs with very low flow rates. These support a great deal of plant and animal life. The model may be helpful as a rough first estimate of effects, but it is of little value beyond that. A much more detailed model that includes the actual locations of releases is essential for the CRIEP to be meaningful. The cost of a mathematical model may be prohibitive and unjustified. The model may need to be a physical or empirical model to yield meaningful results at reasonable costs.

6. The CRIEP bases its analysis of cumulative health impacts on exposures from on-going releases and fails to address historical contributions to the river and its sediments from reactor operations. M-30-02 makes no such limitation in scope. The historical releases of chemicals and radionuclides directly to the river must also be covered. This will dramatically impact the sediment pathway. The CRIEP ignores all aspects of chemical and radionuclide transport via the sediments.

7. The CRIEP ignores many routes of exposure, including skyshine, skin absorption and bioaccumulation through sediment and detritus. The CRIEP ignores the stagnant or low flow effects of the sloughs which were used as filtered discharge paths. It also neglects the low flow effects of the pools and channel margins. These low flow areas of the river are highly used by river life and may also be used by people. The aerial radiation maps of the site show these areas and the islands to be the most highly contaminated areas of the river.

8. The CRIEP is limited to the 100 areas. This appears to be a consequence of the milestone M-30-00 specifically addressing the 100 areas. It is a mistake to limit this plan solely to the 100 areas. The effects on the river occur across the entire length and breadth of the river.

   If the CRIEP is limited to the 100 areas, a separate study and plan will be needed for the rest of the river impacts. These will then have to be coordinated. The CRIEP must include study of intentional and unintentional discharges to the river, as well as uncontrolled releases from seeps, streams and surface contamination and runoff. The effects of the plumes from the 200 areas, the 300 areas, the 1100 area and specific discharge points must also be included.

It makes more sense to integrate the entire site characterization and all site impacts on the river into a single plan and study. The fish and other biota of the river do not distinguish between one area of the river bank and another. They move along its entire face. Likewise, the river flows past the entire length of the site and the effects accumulate. The consequences to people downstream are cumulative. By treating them separately, this is missed.

9. The CRIEP assumes the hazards from contamination of the river by the site can be adequately assessed by subtracting the levels of contaminants and nuclides measured above the site from those below the site. The wide variations in river conditions and transport mechanisms make this assumption extremely suspect.

   This assumption makes it easy to ignore the effects of the Hanford site due to the mass of materials measured in the river background.

   The added impacts from the site need to be assessed first by themselves, then in contrast to the background from natural sources and bomb debris. The EPA standard of one in a million risk of cancer is easily lost in the natural background cancer risk of 1 in 4.

10. The CRIEP states that no assessment has been made of the effects of sediment on radionuclide transport or fate. If a significant portion of the radionuclides are absorbed or adsorbed on sediments, they may not be found during water analysis. Filtration is commonly employed in water analysis as a first cleanup step. If they are carried on sediments or as colloids or with colloids, they may be filtered out prior to analysis being performed. The CRIEP does not detail the procedures used to analyze the water samples.

11. The CRIEP talks about the decreasing levels of nuclides in the river and leaves the impression that this implies that the levels of nuclides from the site are decreasing. This may be true, but is not supported by the data presented. The radioactive materials in the groundwater from the site have only just begun to enter the river. If no action is taken, these levels will likely continue to rise as radioactive materials are swept out of the soil column and into the aquifer.

    The decreasing levels of radionuclides in the river are attributable to the decay and removal of radionuclides left over from the atmospheric testing of atomic weapons. At the moment, the total levels show a decrease over time due to this effect. This may be reversed in the future as the contamination plumes flow into the river.

12. With the exception of chromium, the CRIEP fails to address reproductive and other hazards to fish and aquatic life which may require the use of lower standards for contaminants and radionuclides than those written into law. Many of the contaminants have reported impacts on aquatic life which are at levels considerably lower than the regulatory standards. The regulatory standards are based primarily on the protection of human health, and often do not consider the impacts on other animals or plants. As a consequence, for large releases, the indirect health impacts on people may exceed the direct impacts.

13. The CRIEP does not adequately address the health hazards posed to the aquatic ecosystems by the exposures in the river. This is particularly important for the endangered and threatened species.

14. The CRIEP makes no mention of other impacts on wildlife. Birds along the river use the muds and plants to build nests. These nests may be highly radioactive. The eggs and young birds are highly exposed to these muds and materials. At other sites around the nation, birds have used such nesting materials and spread radioactive contaminants across great distances. In some cases, they have moved these materials into structures which then set off radiation monitors. (INEL - Naval Reactors Facilities 1970's)

    Other animals also use the streamside muds. These will need to be studied as well. Fish lay their eggs in the river sediments and gravels. This close proximity places them at risk.

15. The CRIEP views the river as a steady and unchanging thing. The natural cycles of the seasons, of day and night, floods, changes in power production at the dams, and of rising and falling water levels add greater complexity to the river. The CRIEP makes no effort to analyze what effects these variations may have on the shoreline, river margins, sloughs, pools and groundwater. These must be included if the CRIEP is to be meaningful.

144. Page 2. Final paragraph of section 1.1, first sentence. "Although the plan is limited in scope to the 100 Area and contaminants that are found there,"... This may meet the limited requirements of the milestone, but is overly limiting in understanding the impacts on the river. The river receives contaminants from the entirety of the site. It is important that ALL sources be evaluated together. The river and the river ecosystem do not distinguish between the various areas. These are man-made distinctions. They do nothing to protect the river and its ecology. This may necessitate a modification to the tri-party agreement to produce a meaningful plan.

145. Page 3. First paragraph, fourth sentence. "To complete this plan, only existing, **readily-available** information was used." This overly limits the CRIEP. Does this imply that classified information was not used, even when it was potentially available?

146. Page 3. Item 1 makes the assumption that the hazardous components in the ground water will never be at higher levels than they are today. No justification is given for this assumption. Future levels of groundwater contaminants may easily be greater than those today due to migration of radionuclides and hazardous materials out of the soil column and into the groundwater.

147. Page 3, Item 2 makes the implicit assumption that any pathway other than that of river water as the primary transport medium is of negligible and ignorable importance. No justification is given for this assumption. As noted in later comments, the CRIEP itself indicates that skyshine, sediments and agriculture are major routes that must be considered and evaluated.

148. Page 3. Item 4. The selection of the pathways is unjustified. The pathways must be individually evaluated based on data, rather than on paper assumptions.

149. Page 3. Item 6. In addition to data gaps, additional data collection is needed for all hazardous and radioactive constituents known to have been discharged to the soil, river or groundwater. The depth of this analysis should be based on the findings of the analysis as they occur. It would not make sense to drill wells every 100 feet on a grid and analyze all wells at all depths for all nuclides and all hazardous materials. It does make sense to do broad screening analysis and focus the analysis from there. It will also be more cost effective. Initial screening of this data will probably rapidly reduce the amount of data collection needed.

150. Page 5. First paragraph, fourth sentence. "It is expected that any significant adverse impacts associated with activities in the 100 Area would be observed in the Columbia at the point of impact or immediately downstream of the 100 Area." Additional impacts must be considered.

A. Any downstream location which may act as a collection point for radioactive materials, especially the sediments behind the dams.

B. The dredged river sediments. The dams act as natural accumulation points for silt and soil. In time this must be dredged and the dredge spoils moved. If these soils are used for crops, the radionuclides deposited behind the dams may enter the human food chain.

C. The Hanford area is noted for its dust storms. These storms can disperse any radioactive materials on or

near the surface over a broad area, including areas upstream of the contaminated areas.

151. Page 12. Third paragraph. "On the basis of 1989 results"..."if their concentrations exceeded"... This paragraph carries several implied assumptions. Each of these must be justified.

A. The levels of contaminants found in 1989 are representative of those today. The 1989 data may be the most representative, or most recent. The CRIEP should clarify the reasons for the selection of this data set. It is appropriate that the available data from all years including 1989 be used, but the study and plan should not limit themselves to this data set.

B. The testing in 1989 was comprehensive and adequately identifies all plumes of all contaminants.

C. The groundwater is contaminated by materials which are wholly in the aquifer and no other source of material exists to charge the aquifer.

D. Any contaminants held up in the soil column that did not contaminate the groundwater to levels above the groundwater standards in 1989, will not reach levels which will exceed the standards or at which they are hazardous at any time in the future.

E. The national and state standards are sufficient for the protection of health and will not be lowered.

F. The contaminants do NOT act synergistically in their effects on the ecosystem or human health.

G. The contaminants do NOT act cumulatively in their effects on the ecosystem or human healthy. (Cumulatively with exposure over time.)

H. The contaminants do NOT act additively in their effects on the ecosystem or human health, even if individual contaminants are found at levels below their individual limits. (Additively by similar effects from different contaminants.)

I. The wells in the 100 areas adequately represent the groundwater.

152. Page 23, Tables 2-3 and 2-4. Table 2-3 does not list plutonium-241 or americium-241. These should be listed for completeness. Table 2-4 does not list plutonium-239 and 240, or americium-241. These should be listed for completeness.

153. Page 32, fourth bullet. This bullet states that "These isotopes accumulated in aquatic organisms." This disagrees strongly with

the last paragraph on page 3, which states that these isotopes do not accumulate in aquatic organisms! The CRIEP must include research and studies to determine which of these is correct.

154. Page 34, Table 2-7. There are numerous entries in the table showing **negative** concentrations of nuclides in the sediments. In three cases (ruthenium-106, cesium-134 and cesium-137) these are statistically significant and outside the error limits. These negative values bring **all** of the data into question. **These must be explained and new data collected. The analytical procedures used need to be identified and described in detail! This is a major problem!**

155. Page 37, fourth paragraph, last line. "According to the authors, these residues seemed to exert little influence on reproductive success and were believed to originate on heron wintering grounds located off the Hanford Site." Both allegations must be supported or deleted.

156. Page 41, last paragraph. "This does not necessarily mean that significant impacts have not occurred, only that the tools to evaluate the impacts are lacking. Consequently, impacts due to river sediments will not be further evaluated in this report." This greatly limits the scope and accuracy of the CRIEP. **The sediment impacts must be evaluated as a part of the CRIEP. If the techniques needed to perform this analysis do not exist, they must be developed and used.**

157. Page 42, third paragraph. "Other pathways not evaluated in the qualitative evaluation that should be kept in mind for future quantitative assessments include human ingestion of waterfowl, venison, irrigated crops, riparian vegetation, and beef and milk obtained from cattle fed irrigated forage." This paragraph limits the scope of the CRIEP to the eating of fish. In addition, herbs, berries and other plants irrigated from the site, including dryland and irrigated farming must be evaluated. The indigenous peoples of this area use a wide variety of plants as foods and medicines. This exposure route must be analyzed.

158. Page 42, fourth paragraph. "Exposures in non-aquatic sensitive habitats (as derived from 40 CFR Part 300, Appendix A) or in non-aquatic critical habitats (as defined in 50 CFR section 424.02(d)) of endangered or threatened species to contaminants in the Hanford Reach do not, at this time, appear to be significant concern from the perspective of environmental evaluation." With this statement, the CRIEP dismisses all evaluation of threatened, endangered or sensitive species for health impacts. It is unacceptable to take threatened or endangered species to measure the impacts of the hazards on their health. None the less, it is essential that actual data be used to justify such a dismissal, rather than an out-of-hand assessment without supporting data.

159. Page 43, section 3.3.1, last paragraph. "Table 2-3 shows estimated groundwater flow rates"... This is in error. The flow rates are listed in Appendix B, Table B-1.

160. Page 44 onward. The model selected is overly simplistic and does not adequately evaluate the impacts on sloughs, pools and river margin areas. It does not adequately address mixing or entry effects. It is useful only as a rough first order estimate and should not be relied on any further than that. The model is only useful to one order of magnitude.

The first sentence of section 3.3.2.2 on page 50 states "the computational estimates provided by the model are order of magnitude results." The preamble to the model on 44 also indicates that the assumptions used in the model are invalid. As a consequence, Figures 3-5 through 3-10 must be evaluated and compared to one-tenth of the regulatory limits (or other levels of concern, such as aquatic toxicities) to identify areas of non-compliance.

161. Page 51, Figure 3-5. 100K-1, 100N-1 and 100D-2 each show levels of tritium potentially in excess of drinking water limits (see previous item), by up to a factor of 5. Actual measurements listed elsewhere in the document confirm tritium levels in excess of the drinking water standard.

162. Page 52, Figure 3-6. 100N-1, 100D-1 and 100F-1 all show levels of **strontium-90 distinctly in violation of drinking water standards** by up to two and one-half orders of magnitude.

163. Page 54, Figure 3-8. 100F-2 shows uranium potentially in violation of drinking water standards in the river.

164. Page 55, Figure 3-9. 100D-1 and 100F-2 show nitrate ion potentially in violation of drinking water standards.

165. Page 56, Figure 3-10. 100D-1 shows chromium in possible violation of drinking water standards.

166. Page 59, section 4.1.1.1, paragraph 2. ..."U is a naturally occurring radionuclide (>9wt% ^{238}U)"... It is not apparent what the authors intended to say here -- perhaps "(>99wt% ^{238}U)"?

167. Page 61, second paragraph. Children and infants are specifically omitted for evaluation of exposure for river uses. No justification is provided for this. Children are usually taken on outings. In addition to being more sensitive than adults, they are more likely to play in (and eat) the soil and sand. Also, the river exposures seem to presume that the radionuclides are dissolved in solution. Much of this material may be bound to colloidal and organic material. These will be ingested with the water, and may affect the transport paths and uptake of the radionuclides and contaminants.

Standard analytical techniques often use filtration as a first step in analysis. If this has been done for the river water samples, the values reported may not include the contributions from colloidal materials and sediment fines. The analytical procedures used for water samples must take this possibility into account. For total levels, the samples will have to be "digested" to free the radionuclides from any sediment or colloidal material present. The report must state the methodology used to create this data.

168. Page 64, first paragraph. "Since upstream and downstream concentrations of U are identical, the intake value for this radionuclide is zero;"... This contradicts Table 3-1 which indicates that 100H-2 is contributing 580 pCi/second and 100F-2 is contributing 2,800 pCi/second. Additional contributions from other sources is not detailed. Given a minimum river flowrate of 1,020 cubic meters per second, this corresponds to a conservative river contribution to intake of 66 pCi in the Residential Scenario, and an ICP of 2.3E-9. This is small, but not zero.

169. If a meaningful estimate is to be made of the contribution of the Hanford site to the health risk, then the risk posed by the releases from Hanford need to be evaluated separately from those attributable to natural background and nuclear weapons tests. These may then be compared to the background to place them in perspective. To wave away the risks entirely because the background is high is not acceptable.

The background risk for cancer in the general population is about 25% If other industrial river users were to use a similar logic, almost no preventative or control measure would be accepted. Each individually would disappear into the background created by all of the others. EPA has taken the approach of evaluating each risk separately with a one in a million chance as a threshold of concern. With all of the myriad of exposure sources, these risks add up. With a thousand separate exposures at one in a million, the collective cancer risk rises to at least one in a thousand.

Many of these exposures are not additive. They may act in additive, antagonistic, cumulative or synergistic ways to increase or decrease the total risk. If the exposures are synergistic, they may increase the risk many times beyond a simple addition of the separate risks. Similarly, assaults on the immune system are often not simply additive. This is recognized in the CRIEP in the discussion of threshold effects for some hazardous materials. Treating the risks as acceptable if they can just be hidden in the background data provides little in the way of public health protection.

170. Page 68, Uranium. No mention is made of the hazards posed by the daughters of Uranium decay. These may be significant.

171. Page 70, last sentence of second paragraph. "The chemical contaminants of potential concern (i.e. Cr and NO_3) are not carcinogenic when ingested." This is an unproven statement without support. Hexavalent chromium is a known human carcinogen when inhaled. There is insufficient data to judge its potential to cause or promote cancer when it is ingested. It is a great and unjustified leap to go from insufficient data to a flat statement that it does not cause cancer by ingestion. Delete the sentence or provide scientific justification for its retention. The presumption that a chemical is non-hazardous until it has been proven by peer reviewed study to be harmful is not a conservative approach to the estimation of the hazard to public health.

172. Page 70, third paragraph. "The residential water ingestion scenario is associated with a cancer probability of 8E-07 (Table 4-3), and is due almost entirely (≈90%) to ^{90}Sr. This is a negligible risk because it is less than the 1E-06 cancer probability considered significant for regulatory purposes (40 CFR 300.430)." The data used in this study is valid to only one decimal place. 8E-07 is indistinguishable from 1E-06 when measured to one decimal place. Much of the modeling used is only accurate to within one order of magnitude. If the 8E-07 number is subject to this degree of inaccuracy, it may be eight times the level of concern.

173. Page 70, formula at bottom. The RfD is misplaced.

174. Page 71, section 4.1.5, second paragraph. This paragraph is circular and self referential in its argument. Only six contaminants of concern were selected, and since two of these provided the bulk of the risk from these six, the screening procedure is deemed to be valid. The screening procedure can only be credibly evaluated if ALL of the potential contaminants are considered and the risks are summed. In addition, all of the potential inhalation, ingestion, and absorption routes need to be fully included. Because these were eliminated, they were not considered and their contribution to the total risk cannot be evaluated.

175. Page 72, fourth paragraph. This paragraph states that 25% of the exposure is attributable to agricultural products. **This is an astounding statement!** The CRIEP specifically omits any study or evaluation of this exposure route. In addition to the actual exposure, the social and psychological effects of this information can be dramatic and can lead to enormous loss of income to the farmers of Oregon and Washington! The farm products need not have a demonstrated risk for consumers to avoid them entirely. The perception of a risk is all that is needed. **Based on this statement alone, it is essential that the agricultural ingestion route be studied as a part of this plan!**

176. Page 73, first line. "The uncertainty inherent in either challenge is likely to bound the accuracy of slope factors to no less than an order of magnitude." This greatly broadens the potential risk stated throughout the CRIEP. This increase must be reflected in all of the calculated risks.

177. Page 73, second paragraph. "Given such an extreme range, EPA radionuclide slope factors are likely to represent an upper bound estimate of the carcinogenic potential of radioactive contamination." Quite to the contrary. As stated earlier in the paragraph, ..."recent calculations based on similar assumptions but including Japanese survivor data yield about three times higher risk." In addition to the ten fold increase needed to provide a conservative estimate from the prior item, an additional three fold increase is required based on BIER IV data as compared to the BIER III data used for the CRIEP. Together, these require that all of the risk factors calculated in this plan be multiplied by a factor of thirty! When additive, cumulative and synergistic effects are for all radionuclides are considered, this factor may be even larger.

178. Page 73, third paragraph. This paragraph contradicts the prior two in stating that the CRIEP is conservative. At each step the minimum possible risk was assigned to the data. Potential risks were neglected if they failed individually to meet a cut-off criteria. No additive, cumulative or synergistic effects were taken into account. This does not sound like a conservative approach.

<u>As written, the report must be taken as a **less than a lower bound** on the risks associated with the releases into the river</u>, rather than as an upper bound as suggested by this paragraph. Based on the comparison of risk data from the BIER IV report compared to the BIER III report, all of the risks in the CRIEP must be multiplied by a factor of three to reach a lower bound estimate of the risk. Even then, based on ^{90}Sr alone, the risk is greater than 1E-06 (2.4E-06). The last sentence of this paragraph ends with "would be more than adequate to demonstrate a bounding risk estimate for the residential scenario to be well below 1E-06." As noted above, the data presented in the report demonstrate that the bounding risk of the residential scenario is at least 2.4 times the 1E-06 level of risk. It may be much higher. This sentence is wrong and must be revised or removed.

179. Page 73, second sentence of the fourth paragraph. "Skyshine"..."provide a maximum exposure rate of approximately 0.03 mrem/hr along the shoreline (Brown and Perkins 1991)." This adds to the radiation burden to people exposed to a small degree. It adds to the radiation burden of aquatic and shoreline plants and animals to a much larger degree. This risk is significant for both and must be included in the risk assessment.

180. Page 75, fourth paragraph. "Based on an evaluation of existing data, the NCRP has established that a chronic dose rate of 0.4 mGy/hour (1 rad/day) to the maximally exposed individual population of aquatic organisms should ensure protection for the population." This is a considerable leap!

There is no demonstrated protective function of radiation exposure. (Other than possibly cancer treatment by high dose x-ray.) The risk and adverse health impacts of this exposure may be minimal or acceptable at this level, but that does **NOT** make it protective!

Based on equivalent exposure to humans, this statement appears to be grossly unjustified. Exposures at this level may cause major changes to immune function and other biological processes. This opens the organisms to a variety of disease processes, even if they do not suffer immediate and direct physical harm from the radiation.

This in turn may cause indirect health impacts on people who consume these plants or animals. The assertion that this level of exposure is harmless is suspect at best. Additional justification of this statement showing the health impact on the whole population and ecosystem is needed. This assessment needs to cover all aspects of the health of these systems. It must not be limited to cancer.

181. Page 75, section 4.2.1.2. "The chronic ambient water quality criterion for the protection of freshwater aquatic life for hexavalent Cr has been set at 11 µg/L by EPA." This limit must be the basis for the maximum allowed hexavalent chromium levels in the river, including the naturally occurring chromium. In other words, if the natural background is 12 µg/L, then 0.0 µg/L of additional hexavalent chromium should be allowed. This limit puts all of the plumes in potential violation with the possible exception of 100BC-1. Also, no single industrial user would ever be allowed to burden a river with its maximum carrying capacity of a contaminant. Certainly, no industrial user would be allowed to burden the third largest volumetric discharge river in the continental United States to beyond its carrying capacity of any contaminant.

182. Page 81, section 5.1, last paragraph. This paragraph makes two references to 'under existing conditions'. The CRIEP and earlier discussions do not adequately address future levels of contamination from groundwater transport into the river. This must be a part of any study on the impacts on the Columbia River. There are no acceptable models that will adequately allow prediction of the transport of radionuclides from the vadose zone into the groundwater. The models for transport of these nuclides from the groundwater to the river are poor. They are especially difficult to use in zones such as the 100 areas where rising and falling water levels in the river can dramatically effect the subsurface hydrology.

It is highly likely that there will not be an acceptable model of vadose zone transport for several decades. It does not make a great deal of sense to push for extensive modeling in this fashion. Other approaches need to be utilized. The most important approach is to begin actively removing the source materials. The next most important is to begin immediately pumping and treating the groundwater to prevent it reaching the Columbia River. This pump and treat operation will probably not do much significant cleanup of the source material in the groundwater. It will act as a stop gap measure to pull back the contaminant plumes and to hold them in place while other work is done.

183. Page 82, first sentence. "These zones of impact dissipate quickly downstream due to contaminant dilution." The Washington State Administrative Codes specifically disallow any consideration of dilution effects in the receiving body. See page 86, Activity 1A-3. "Under WAC 173-340-730(6)(b), no dilution zone is allowed to demonstrate compliance with the calculated standard when a surface water body is impacted by contaminant discharges through groundwater."

184. Page 82, last paragraph. **"The most effective and efficient long-term investigation for the river appears to be the Hanford Reach, which can be defined as that segment of the river bounded by Priest Rapids Dam down to the head of Lake Wallula; however, the lower boundary should be extended downstream of Hanford for the purpose of investigation of sediment and biotic impact. Therefore it is recommended that consideration be given to treating the river as a whole for the purpose of consolidating resources and increasing efficiency of actions required to comply with the TriParty Agreement requirements."**

Oregon emphatically agrees. The area of study should extend from Preist Rapids Dam past Hanford to McNary Dam.

185. Page 83 & 84, section 5.2.1 Data Quality Objectives. All references to the Hanford Reach and the 100 areas need to be changed to reflect analysis and study of the entire river segment from Preist Rapids Dam onward past Hanford to McNary Dam.

186. Page 86, Activity 1A-1. The identification of contaminants and impacts must also consider USDOE's duties under the Natural Resource Damage Assessment (NRDA) provisions of the Comprehensive Response, Cleanup and Liability Act (CRCLA). By dividing the assessment on an operable unit by operable unit basis, additive, cumulative and synergistic effects will be systematically ignored.

187. Page 86, Activity 1A-3. "Under WAC 173-340-730(6)(b), no dilution zone is allowed to demonstrate compliance with the calculated standard when a surface water body is impacted by contaminant discharges through groundwater." Then the next paragraph says, "However, actual cleanup standards"...

Despite the legal requirements, the CRIEP is basing its actions on deciding what is acceptable, without specifying who would make such a decision, and what criteria they would use. This is unacceptable. Compliance with the law is mandatory. Compliance allows for protection of the human health and the environment and avoids costly legal entanglements that do nothing toward cleanup.

188. Page 87, third paragraph. ..."induced tracer studies with another plume will be considered." It is vital that any such study evaluate the potential impact of the tracer on the ecosystems, and on the contaminants and other materials in the path of the tracer. Many of the available tracer dyes are suspected carcinogens. Many of the tracers are potentially chelants for a variety of nuclides. The use of tracers may be helpful, but must be planned with caution.

189. Page 87, second sentence of first paragraph of Activity 1A-4. "This conclusion, however, assumes that all hexavalent Cr in the groundwater remains in this valence state in the river water column. Hexavalent Cr is thermodynamically unstable in soils and natural waters, provided a sufficient amount of reducing agent such as organic material is present (Dragun 1988; Syracuse Research Corp. 1991)." This is a true and misleading statement.

Hexavalent chromium can be reduced by organic matter to trivalent chromium. This can either be accomplished under severe acid conditions (pH 1-2) with an excess of strong reducing agents present, or enzymatically under favorable conditions. If oxidizing conditions are present, and if the pH is neutral or high, then the reaction rate is nearly zero. Under adverse conditions, the chromium may convert over geologic time scales. Also, if oxidizing and acidic conditions exist, the chromium can equally as easily be converted from trivalent form to hexavalent form.

It is important to study the natural conversion of chromium from one oxidation state to another. It may even be possible to promote this in the soil column. The chances of this leading to great reductions in hexavalent chromium concentrations are small. Addition of tailored bacteria may have the greatest chance of success in this area. In the presence of other energy sources (foods), this is likely to fail. Such a study is needed to determine the fate of the chromium VI. It is not acceptable to use this as a justification for minimizing the potential effects of the chromium contamination of the soils.

190. Page 88, Activity 1A-4 - Cr Speciation. This activity identifies TOC as a contaminant to measure. Total Oxidizable Carbon, or Total Organic Carbon as it is variantly known is a very poor measure. Each form of carbon compound responds to the analytical test somewhat differently. The test does not identify broad ranges of organic compounds. This test is marginally useful as a course screening test. To be useful, the known targets of the search need to also be analyzed for. In particular, if

chlorinated compounds may be present, EPA test procedures using techniques such as GC/MS (or better) are required.

191. Page 89, Activity 2-1, second paragraph. The program also needs to be studied for test methodology, handling and preparation of blanks, insertion of spiked samples and known samples. Earlier data in the report show analysis that are simply not possible. (e.g. Negative values of radioactivity.) This is an indication of a highly unacceptable testing program. The QA/QC, reliability, accountability and traceability aspects of the program need close scrutiny.

192. Page 90, Activity 2-2 - Surface Water Modeling, last paragraph. The selection of a model or models, must be done in an open process with extensive input from the States, Tribes and Public if it is to have any credibility at all.

    Also, if the model is to make a cumulative impact assessment, it must consider all of the data inputs. The intentional removal of potential contaminants of concern in the early stages of data acquisition will fatally cripple the model.

193. Page 92, Activity 4-1 - Compilation of Ecotoxicological Data. This section discusses the low order of toxicity of soluble Uranium, then goes on to discuss Uraniums low degree of solubility. When this is combined with the intentional dismissal of the sediment pathway, the Uranium is intentionally missed by the CRIEP. This defect must be repaired. The sediment pathway must be included.

194. The Sierra Club's comments are limited because the CRIEP received was missing pages 24-62, which includes the introduction to the Risk Assessment.

195. Section 4: This is an inadequate treatment of the risks associated with uses of the river. I will only mention a few problems. The assessments are not, as claimed, conservative. Most sensitive populations, such as children, should have been used in the recreational example. Fish consumption quantity was entirely too low, particularly for consumers of large quantities, such as Native Americans. The FDA uses 69 g/d for subsistence consumers and 140 g/d for high subsistence consumers. The assumption that all hikers carry soda and do not drink over 1 L of water is not valid.

196. Section 4: We do not believe that cancer induction is the only concern for exposures to environmental radiation. Immune suppression has been noted, particularly in Ukraine and Russia, and should be mentioned.

197. Section 4: What is the source of background radiation in the Columbia above the Hanford Reach? Have historical practices dispersed radiation in the area to a level that should not be ignored? How does it compare to other Western Washington rivers,

for example? We have concerns that subtracting background could underestimate impacts.

198. Section 4: The environmental and ecotoxicity assessments should not suggest that impacts are minimal until much more actual monitoring and test data is available. The uncertainty discussion is appreciated. Data gaps do exist, such as the limitation of studying fish and drinking water. Potential whole body exposures, such as to water skiers downstream, should also be considered.

199. Section 5: This study should extend beyond the Hanford Reach. Focus on data from 100 Area impacts is not sufficient for evaluating the entire impact of Hanford operations on the River. Species composition beyond the Reach should be studied and related to historical information. Downstream impacts, bioconcentration and other ecotoxicological studies, should extend as far as the mouth of the Columbia. Epidemiological information and interviews with populations living close to the River should be used to suggest what additional studies might be necessary.

200. Page 5, Section 2.1.1, paragraph 1, last sentence. It should read "The **draft** environmental statement...". The final EIS is expected this fall.

201. Page 20, and throughout the CRIEP. In the middle of the page, Cr^{6+} is used but not defined. At the bottom of the page ^{3}H is used but not defined. This is done for other contaminants as well throughout the document.

202. **Introduction**

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) has reviewed the Columbia River Impact Evaluation Plan (CRIEP) and provides the following comments. Our comments are organized into the following sections:

- The Tribal Context
- Need For a Comprehensive Review of Impacts to the Columbia River Environment
- The CTUIR's Concerns Regarding the CRIEP
- Review of the Technical Completeness of the CRIEP
- Proposed Data Collection Activities
- Conclusions

I. The Tribal Context

A. Historical Context

The Umatilla Indian Reservation is located near Pendleton, Oregon. It is occupied by descendants of three Columbia Plateau tribes: the Cayuse, Umatilla and Walla Walla. Together, the three tribes comprise the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). In historical times, the Wallulapum band, part of the Walla Walla Tribe, occupied a large area centered on the confluence of the Yakima, Snake and Columbia rivers. In addition, descendants of the Wanapum band, a band that resided along the Columbia River in the area now referred to as the Hanford Reach, are also members of the CTUIR. The eastern portion of the Hanford Nuclear Reservation, including the Hanford Reach, is located on these Tribes' traditional lands.

In 1855, the Cayuse, Umatilla and Walla Walla tribes entered into a treaty with the United States. As part of this treaty, the Tribes ceded 6.4 million acres to the United States in return for concessions by the United States. In particular, the Tribes retained the right to perform certain activities in their traditional lands. These rights include the rights to fish, hunt, pasture livestock and gather plants.

B. CTUIR Hanford Context

Because of its strong governmental interest in Hanford, the CTUIR is actively participating in Hanford clean-up planning processes. These planning activities range from participation as a Trustee for Natural Resources[1] to participation on forums such as the

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[1]See CERCLA, Section 107(f); 40 CFR § 300.5; 40 CFR § 300.610.

Hanford Future Site Uses Working Group and the Tank Waste Task Force. The CTUIR is also providing comments on planning documents released for public review.

The CTUIR recently released a document that expresses the CTUIR's general concerns about Hanford cleanup activities. This document, Criteria for Evaluation of Proposed Changes to the Hanford Federal Facility Agreement and Consent Order, was developed for use in the TPA revision process. As a reference tool, it can be used by any party interested in learning the nature of the CTUIR's concerns at Hanford.

The Criteria provides the general framework for CTUIR's participation in Hanford cleanup under various environmental laws and regulations (CERCLA[2], RCRA[3] and NEPA[4]).

Following is one of the key topics discussed in the CTUIR's Criteria document:

> "Protection and restoration of the environment, both on the Hanford site and in areas affected by Hanford over which the CTUIR exercises off-reservation treaty rights. Protection of the environment guards the natural resources upon which treaty rights are based, including Columbia River fisheries and related resources."

C. Environmental Context, Importance of the Columbia River to the CTUIR

From salmon and sturgeon to tule reeds and eagle feathers, the ecosystem provides the very fabric of tribal culture. Any impact evaluation that considers the Columbia River environment should assist the CTUIR in understanding and evaluating the magnitude and future consequences of adverse impacts on natural resources.

The Columbia River and associated aquatic and terrestrial ecosystems are of great significance to the CTUIR. The meaningful exercise of tribal treaty rights within usual and accustomed areas is entirely dependent on the health of the ecosystem and its natural resources. A treaty right to fish, take wildlife or gather plants is hardly useful if individuals or populations of fish, wildlife or plants have been reduced in their abundance, become threatened with extinction or themselves become human health risks.

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[2]The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) 42 U.S.C § 9601 - § 9675.

[3]The Resource Conservation and Recovery Act (RCRA) 42 U.S.C § 6901 - § 6992K.

[4]The National Environmental Policy Act (NEPA) 42 U.S.C § 4321 - 4370b.

Natural resources are significant to the CTUIR for a variety of reasons. Tribal members are subsistence hunters and gatherers. Wild game and fish form a major part of the diet of many tribal members.[5] Likewise, plants collected from a healthy environment form an important feature of many tribal members' diets. Besides consumption as food, these resources are collected for religious ceremonies, cultural uses such as medicines, clothing, decoration and traditional crafts and recreational purposes.

All indigenous plants and animals have religious significance to CTUIR members who practice traditional Indian religion. In addition, these resources, such as chinook salmon, can be of great economic importance to the CTUIR.

The CTUIR's overall land management philosophy for Hanford is that environmental restoration must be considered the primary focus of activities. This ensures that timely and effective "clean-up" of contamination is conducted in a manner that optimizes sustained net flow of tribal benefit through the conservation, management and utilization of fish, wildlife, plant and cultural resources, while protecting the integrity, sustainability and diversity of the natural ecosystem.

203. II. Need for a Comprehensive Review of Impacts to the Columbia River Environment

It is our understanding that the TPA M-30 milestones narrowly focus studies on impacts created by 100 Area activities. However, a true cumulative impact evaluations cannot be completed without a broader consideration of the collective effects of all contaminant-contributing Hanford operations on the river environment.

The CTUIR supports the development of a thorough environmental and human impact evaluation that considers the magnitude and effect of Hanford contamination and the fate and transport of contaminants throughout the natural ecosystem. An analysis such as this would culminate in a cumulative impact assessment documenting Hanford-induced effects on Tribal treaty-rights, natural resources and Tribal members. An assessment of the cumulative environmental effects both within the Hanford Reach and in downriver areas are critical components of remediation and environmental restoration at the Hanford Nuclear Facility.

204. A complete summary of the known information pertaining to contamination of the Columbia River environment should be provided. This summary would provide the framework for identifying data gaps, additional research needs, future remediation and environmental clean-up strategies and ecological and human dangers. The net result should broaden the

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[5] CTUIR dietary data collected during the preliminary phase of the Hanford health studies confirm this conclusion.

understanding of historical, current and foreseeable impacts caused by Hanford to the Columbia River environment. This baseline information would assist the CTUIR in quantifying impacts to Treaty-reserved rights, natural resources and the health and welfare of the tribal community.

The analysis should provide pathway analysis, deposition rates, uptake rates and consumption factors in assessing human health impacts. These data would allow the CTUIR to assess the magnitude and extent of impacts on the tribal community.

205. As a baseline, this analysis should identify damages to natural resources and attendant Treaty rights and provide information for future use in the Natural Resource Damage Assessment process. The CTUIR, as a Trustee for Natural Resources affected by Hanford operations, is profoundly interested in the development of future activities at Hanford related to the Columbia River.

206. **III. The CTUIR's Concerns Regarding the CRIEP**

A. THE CRIEP FAILS TO PROVIDE A CUMULATIVE HEALTH AND ENVIRONMENTAL IMPACT EVALUATION

The CTUIR believes that any assessment of cumulative health and environmental impacts should include a complete overview of impacts resulting from historical, current and foreseeable sitewide Hanford operations. This type of assessment should provide a comprehensive view of the collective effects of Hanford activities as opposed to considering only portions of the impacts. The CTUIR contends that such an approach represents both the letter and spirit of the TPA M-30 milestones.

The following discussion points out the major shortfalls of the CRIEP in disclosing information on cumulative health and environmental impacts and in failing to meet the overall intent of the TPA M-30 milestones.

1. Human Health Impact Evaluation

The CTUIR believes the CRIEP is inadequate. The CTUIR questions its validity in thoroughly evaluating human health impacts. This conclusion is based on the CRIEP's exclusion of ongoing Technical Steering Panel (TSP) and the Native American Working Group (NAWG) activities, dependance on incomplete data sets or analyses, uncertainties associated with the conclusions contained in the CRIEP and the failure of the CRIEP to review and integrate other research.

The TSP oversees the Hanford Environmental Dose Reconstruction Project (HEDRP) that is researching the amount, dispersion paths, deposition and health affects associated with past operations at Hanford. Two pathways are under review by the TSP, the air pathway and the water pathway. This panel is also associated with the Hanford Thyroid Disease Study (HTDS).

The CTUIR is involved with TSP through NAWG. On a regular basis, representatives of eight Columbia Plateau tribes convene to discuss impacts to tribal communities from the two pathways. This aspect is critical to note: tribal communities have increased exposure to environmental contamination because the use of fish, wildlife and plants for subsistence and cultural activities is at a much higher rate than the general population.

One particular TSP document that considered the River pathway[6] notes that "Preliminary dose estimates were calculated to demonstrate the feasibility of reconstructing doses" [emphasis added]. The CRIEP however states that "In general, radionuclides are only evaluated with respect to the carcinogenic potential associated with ionizing radiation."[7]

207. The CTUIR concurs with the statement in the CRIEP that "Uncertainty with respect to the toxicity assessment is related to uncertainty in the toxicity values used and uncertainty in the overall toxicity assessment."[8] Research being conducted by the TSP is focused on identifying the correlation between human health impacts and Hanford-induced environmental contamination. Until this study and the model are completed, conclusions about health effects contained in the CRIEP are unsubstantiated and should be removed from the document.

208. **2. Environmental Impact Evaluation**

The DOE describes the CRIEP as a document that will provide the framework for determining cumulative health and environmental impacts to the Columbia River. It also states that the CRIEP will provide a characterization of river resources and valuable information for the 100 Area risk assessment[9].

The CTUIR question the legitimacy of the CRIEP for use as the baseline for future natural resource and ecosystem risk assessments because the cumulative effects from all Hanford operations on the Columbia River environment are not integrated into a single assessment. Only 100 Area contamination is discussed; significant contributions and impacts from other contamination sources are disregarded.

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[6] Columbia River Pathway Report: Phase I of the Environmental Dose Reconstruction Project. HEDR Rev. 1, UC-707, Pacific Northwest Laboratory. July 1991, PNL-7411 .

[7] Columbia River Impact Evaluation Plan, DOE/RL-92-28, Revision 0, Page 68.

[8] Ibid., Page 72.

[9] Ibid., Pages 1 and 2

The CRIEP should integrate all relevant data and contain a summary of environmental monitoring information from the beginning of Hanford operations in 1943 through the present in order to allow an analysis of environmental impacts from Hanford activities. Transport of chemical and isotopic compounds throughout the Lower Columbia River system should also be discussed rather than focusing the analysis only on the Hanford Reach of the Columbia River.

The analysis needs to view the Columbia River as not only water, but as an interdependent ecological unit (including wetlands, riparian and upland components) where no one part can be separated from the other. The CRIEP fails to integrate these fundamental concepts.

209. **B. THE CRIEP IS AN EXAMPLE OF THE MANAGEMENT AND POLICY PROBLEMS PLAGUING HANFORD SITE RESTORATION**

The recently released Schedule Optimization Study (SOS)[10] contains 57 recommendations regarding problems with management and policy at Hanford. These findings "indicate the most serious impediments to environmental cleanup of the Hanford Site are related to a series of management and policy issues that are within the control of the three parties managing and monitoring Hanford."[11]

Recommendation twenty-two of the SOS states that "Hanford should develop a comprehensive sampling and analysis strategy for the site, including providing appropriate staff training." The issue statement for this recommendation is the "Failure of DOE to generate necessary supporting data." The CRIEP is a clear example of this issue because it does not contain a comprehensive review of existing data.

The CTUIR's goal in participating in clean-up activities at Hanford is to ensure that cost effective, efficient and timely clean-up efforts protect Treaty rights and natural resources.

210. **C. THE DOCUMENT FAILS TO ADDRESS EXISTING INFORMATION PERTAINING TO CONTAMINATION OF THE COLUMBIA RIVER CORRIDOR**

A specific example of the CRIEP's failure to provide an overall view of the impacts resulting from Hanford operation is found on page 12 of the document, where it is noted that "groundwater is the primary pathway for environmental contamination and impact on the Columbia River." The CRIEP also acknowledges the concept of "skyshine" as an additional potential pathway of contamination.

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[10]Schedule Optimization Study, Hanford RI/FS Program, Volume 2: Final Report, December 1992, EMO 1080 Vol. 2, AD-902A.

[11]SOS, Page xiii.

However, the plan fails to fully recognize the impacts caused from numerous other contaminant sources such as[12]:

1. Miscellaneous Radioactive liquid wastes.
2. Radioactive sludge/radioactive solid waste.
3. Sanitary liquid waste.
4. Nonradioactive liquid waste.
5. Nonradioactive sludge/nonradioactive solid waste.
6. Leaking underground storage tanks.

211. The CRIEP discounts historical contamination of the 100 areas and focuses only on groundwater plumes currently releasing contaminants to the Columbia River, ie., upgradient groundwater contamination. No information is provided that discusses the amount of contamination (chemical and radioactive) that has been deposited as liquids to ground nor is there any discussion disclosing information pertaining to contaminants stored as solids in the upland soil column. A large portion of this contamination has yet to leach into the groundwater but will eventually reach the Columbia River in the near future.

212. An additional example of the CRIEP's failure to fully consider all contaminants and existing information is illustrated by a recent presentation to the TSP by Battelle researchers. During the presentation, "Integrated River Pathway Activities/Scoping Studies,"[13] several technical approaches were identified that would be applied or included in their studies. One of these topics acknowledged the task of evaluating river effluents and the release of approximately two thousand fuel failures into the river environment.

These topics were also reported in a document[14] prepared by UNC Nuclear for DOE in 1986 that discusses significant radiation sources found along the D-Island shoreline, across from the D-Reactor.

The CRIEP fails to account for these fuel failures and contamination of islands and shorelines. Therefore, the cumulative impacts resulting from Hanford operations have not been comprehensively integrated. Any preliminary findings of the CRIEP are unsubstantiated without this information and there is no basis for judging the cumulative impacts, let alone concluding that no adverse impacts have occurred.

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[12]DOE-RL, 9/92, Remedial Investigation/Feasibility Study Work Plan for the 100-KR-1 Operable Unit, Hanford Site, Richland, Washington; Revision 0, DOE/RL 90-21, U.S. Department of Energy, Richland Operations, Richland, Washington.

[13]Integrated River Pathway Activities/Scoping Studies. Bruce Napier, Presentation to the TSP, April 2, 1993.

[14]UNC Nuclear Industries, River Discharge Lines Characterization Report, Radiological Survey of "D" Island, Beckstrom, Steffes, 1986

213. **D. THE DOCUMENT CONTAINS INADEQUATE TECHNICAL DATA AND PROTOCOL**

Throughout the CRIEP, it is stated that only "readily available" data is used in this assessment. It is unclear what this term means. A complete review of over 50 years of information should be summarized in order to provide an overall view of the distribution and magnitude of past and present pollution of the Columbia River as a result of Hanford operations.

In addition, for purposes of assessing water quality and cumulative effects in the Hanford Reach and downstream areas on the Columbia system, other point and non-point source pollutants from sources other than Hanford operations should be fully considered.

214. Sampling and analysis at Hanford has been described as inadequate in the Schedule Optimization Study for the Hanford Site as previously described. An example supporting these findings is illustrated by the DOE's failure to incorporate EPA's comments on the document entitled "Sampling and Analysis of 100 Area Springs."[15] EPA's comment questions whether a one-time synoptic sampling of springs along the shore of the 100 Areas is adequate to characterize and evaluate the impact to the Columbia River.

This is a significant issue because it is unclear in the CRIEP whether additional sampling was completed as requested by the EPA. Information in the 100 Springs document (Milestone 30-01) was incorporated into the CRIEP as baseline information and it appears that this single data set was used to formulate the preliminary impact assessment for the CRIEP.

215. Furthermore, the CTUIR understands that the DOE is relying on water quality data collected from groundwater monitoring wells to predict water quality parameters from 100 Area shoreline seeps and springs. The data from groundwater monitoring wells is, in effect, being extrapolated to predict contaminant concentrations in seeps and springs in place of collecting water samples from these areas. In addition, offshore seeps and springs discharging to the Columbia River, which are potentially affecting the river system, have not been sampled.

216. The CTUIR believes that the monitoring well data used to predict contaminants in seeps and spring are inadequate for evaluating impacts to the Columbia River. The CRIEP should be designed with the most thorough set of data available and if conclusive data is not available, additional water quality sampling needs to be conducted. No conclusions should be made until the data gaps are filled and conclusive information gathered. The CRIEP should make it clear that the statements presented on environmental impacts are considered preliminary and inconclusive.

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[15] Sampling and Analysis of 100 Area Springs, February 1992, US DOE, DOE/RL-92-12.

217. **E. THE CRIEP MAKES PREMATURE STATEMENTS ON ENVIRONMENTAL IMPACTS IN THE ABSENCE OF DEFENSIBLE EVIDENCE**

The CRIEP contains numerous statements that no adverse impacts on the Columbia River environment have resulted from 100 Area operations. The TSP has convened a subcommittee that is reviewing historical reactor operating records to accurately determine the "source term."[16] Until the TSP has completed its activities, assumptions concerning environmental impacts from reactor operations are premature.

218. The CRIEP discounts adverse impacts on the Hanford Reach from spring discharges due to dilution with Columbia River water. However, the mixing process has not been evaluated and some contaminant releases may travel as a plume or slug for some distance before being dispersed. The CTUIR believes that localized impacts on natural resources must also be addressed and not simply dismissed based on DOE's questionable assumption that biological organisms will move away from these areas.

219. In addition, in the conclusion presented on page 24 of the CRIEP it is stated that contaminants of concern in surface water are not significantly different between upstream and downstream collection points. In fact, measured upriver and downriver Tritium concentrations differ by a factor of two in each of the six years between 1986 and 1991[17]. This conclusion is also inappropriate because there is no evidence in the report that the data were statistically evaluated to compare differences and variability between monthly sampling periods, nor is there any reference to conclusive evidence supporting these findings.

220. **F. THE CRIEP PROVIDES NO EXPLANATION ON HOW IT FITS INTO THE OVERALL HANFORD ENVIRONMENTAL "CLEAN-UP" PROCESS**

A 1990 Tiger Team report[18] stated that "A single, cohesive plan for management of past practice activities performed under the TPA is necessary to ensure efficient planning, organization, coordination, budgeting, management, review and control of those activities."

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[16]Source Term is defined by the TSP as the amount, type and location of radioactive materials released to the environment.

[17]Woodruff, R.H., and Hanf, R.W., 1992, Hanford Site Environmental Report for CY 1991, PNL-8148, p.91.

[18]Assessment Finding Number IWS/BMPF-1, Ambiguous Roles and Responsibilities for Management and Quality Assurance of Past Practice Activities Under the Tri-Party Agreement. Tiger Team Assessment Report of the Hanford Site. U.S. Department of Energy, Environment, Safety and Health. DOE/EH-0139, July 1990. Page 3-207.

This issue, identified by the Tiger Team, is clearly illustrated in the haphazard and piecemeal approach taken in the CRIEP. As such, this document falls substantially short of providing a comprehensive, integrated analysis that the CTUIR perceives to be the intent of TPA M-30.

Because the information summarized in the CRIEP will be used in the RI/FS process for establishing baseline information and in the subsequent development of remedial actions, the CRIEP should be rejected because it does not contain comprehensive and/or accurate information.

In terms of TPA language, the CRIEP is a "primary document representing final documentation of key data and reflects decisions on how to proceed."[19] The CRIEP will become a reference document in the administrative record for 100 Area decisions and be incorporated by reference into CERCLA/RCRA decision making processes at face value as a representative description of 100 Area existing environmental conditions. The CRIEP is inadequate in fulfilling this important role.

Therefore, the CTUIR is deeply concerned with the CRIEP because missing and inaccurate information and erroneous or unwarranted conclusions in this analysis will carry through the CERCLA process, falling short of meeting the CTUIR's needs in adequately describing Hanford-induced cumulative effects.

221. The DOE has acknowledged its responsibilities in bringing management of the Hanford Nuclear Reservation into compliance with applicable environmental laws and regulations. In Section 4 of the CRIEP on page 4, it is stated that restoration activities are being conducted pursuant to multiple federal and state statues, regulations and guidelines.

However, the National Environmental Policy Act (NEPA) is completely ignored in the CRIEP. It should be clearly stated in the document how it will be used for future reference in the CERCLA/RCRA and NEPA processes. As a primary document, the CRIEP should provide an overall view of how it will be used in future decision making processes.

222. In addition, numerous other laws and regulations that should be integrated into the CERCLA/RCRA process are omitted. For example, the entire Hanford Reach of the Columbia River has been found eligible for Wild and Scenic River designation under the Wild and Scenic Rivers Act[20]. However, no mention of the

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[19]Hanford Federal Facility Agreement and Consent Order, Volume 1 of 2, Second and Third Amendments, September 1992, 89-10 Rev.2, Section 9.0.

[20]Hanford Reach of the Columbia River, Comprehensive River Conservation Study and Environmental Impact Statement, Draft, June 1992.

River's outstandingly remarkable resource values or river classification is mentioned.

223. In the purpose and objectives section of the CRIEP on pages 1 and 2, it is mentioned that M-30 milestones were developed to initiate a rescoping of the 100 operable unit work plans. The CTUIR requests that the Tribes be involved early in the scoping process which would begin the commitment of government-to-government relations. This would lead to the development of resolutions involving complex environmental issues surrounding Hanford clean-up in a facilitated manner.

224. **IV. Review of the Technical Completeness of the CRIEP**

A. Introduction

The following section provides detailed comments on specific deficiencies of the CRIEP. These comments relate to technical aspects of Chapters 2 and 3, "Characteristics and Nature of Contamination" and "Contaminant Fate and Transport" respectively. The following comments are organized consistent with the organization of the CRIEP. Although every issue is not explored in detail, the following remarks are representative of the major problems the CTUIR finds with the current CRIEP.

B. Chapter 2 Review

Section 2.1.3, Hydrological Characteristics

-- This section provides general information on the Columbia River, but fails to adequately define basic known Hanford Site hydrology. Site hydrology is an important component in evaluating contaminant interaction with the river environment.

225. -- The information provided is poorly summarized and overgeneralized. For example, the long term average annual flow rate at Priest Rapids Dam is stated to be 3,400 m^3/s. This figure is an overall average from 68 years of record. However, the dam was constructed in 1959 and the hydrological regime of the river was substantially altered thereafter. It would be helpful to have a comparison of the flow rates prior to and following dam construction, rather than combining 68 years of record into one "averaged" measure. In addition, peak or maximum expectable flow rates from storm runoff, snowmelt or 100-year flood events should be reported.

226. -- The document fails to mention substantial daily fluctuations in flow rate caused by Priest Rapids Dam management. Water levels at islands and shorelines along the Hanford Reach can

fluctuate as much as 2 meters in a day.[21] These fluctuations will have potential impacts on groundwater and sediment pathways, as well as contaminant fate and transport. The importance of these variations should be fully considered in this evaluation to adequately describe contaminant transport, deposition and bioaccumulation.

227. -- Appendix B provides additional background on hydrologic and hydrogeological characteristics for the Hanford Site; this material should be referenced in the subject section.

228. Section 2.1.4, Ecological Characteristics

-- This section fails to take an integrated ecosystem-level approach; the material presented is limited to the riverine and riparian zones along the Hanford Reach. At a minimum, the discussion should take into account all 100 Area habitats, adjacent upland sagebrush, steppe and bunch grass communities, as well as discussing the important wildlife areas north of the river.

229. -- The text or appendix should provide a complete listing of all State and Federal endangered, threatened and sensitive plant, fish and wildlife species found on-site. There are 24 listed plant species of special concern found at Hanford[22]; the report, however, lists only five. There are 57 wildlife species with endangered, threatened, sensitive or candidate status listed for Hanford[23]; the report lists only four species.

230. Section 2.2, Nature and Extent of Contamination

-- Table 2-1 is described in the CRIEP as containing the mean, standard deviation and range for all determined contaminants of potential concern in groundwater plumes identified in Appendix B of the CRIEP. However, the table does not provide this information. This data forms the basis for all later discussion regarding contaminants of potential concern; its absence from the document makes a meaningful review of the CRIEP infeasible.

231. -- The methodology used for selecting the contaminants of potential concern in the evaluation is highly selective and therefore suspect. First, identification of contaminants of concern is based on selective sampling of wells during only one year, 1989, in spite of the existence of more than 50 years of

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[21]Sauer, Ronald H. and J. E. Leder. 1985. The Status of Persistentsepal Yellowcress in Washington. Northwest Science 59 (3): 198-203.

[22]Vascular Plants of the Hanford Site, Sackschewsky, Landeen, Baird, et al., 1992.

[23]Hanford Site National Environmental Policy Act (NEPA) Characterization, Cushing, C. E., December, 1991. Pacific Northwest Laboratory, Battelle Memorial Institute.

analytical data. Second, the results reported in Table 2-1 are only singular values that cannot be assumed to be necessarily representative of the full range of concentrations found in migrating contaminant plumes. In the absence of a more detailed sampling program, it is unlikely that the reported values represent meaningful data. There is no presentation of how this data compares to historical or TSP source term data.

232. -- In addition, no discussion of the rationale for the selection of "representative" wells to be used for such characterization is provided. The wide and irregular spacing of the selected wells (Figure 2-2 in the CRIEP) effectively precludes a systematic characterization of the nature, areal extent and concentration levels of constituents of interest and results in what are random measurements whose significance cannot be understood in the larger context. Nor is there any discussion in the CRIEP describing whether the monitoring wells used for data collection are in compliance with RCRA regulations.

233. -- Figure 2-5, showing "conceptual" flow directions from 100 Area facilities to the river, is so oversimplified that it is useless; it should be replaced with a more detailed, real-world representation based on measured water-levels and known historical plume migration pathways.

234. -- As stated on page 12 of the CRIEP, the contaminants selected for consideration were identified for groundwater plumes only, but are then applied, without further discussion or qualification, to other (ie., surface water and ecological) potential contaminant pathways. Such an approach not only ignores differences in transport mechanisms, but also differences in chemical interactions between contaminants and soil, water and biological systems and the much longer residence time expected in subsurface soils and groundwater.

235. 2.2.2.1. Hanford Reach Surface Water Contamination

-- The text suggests that several radiological and chemical contaminants are discharged to the River under NPDES permits, but will not be considered in this document. These contaminants should be identified and included in this analysis.

236. -- The large amount of missing data provided in Table 2-5 makes the historical summary of Hanford Reach water quality unacceptable. Over 50% of the data are indicated as "Not Reported." This table does not include a review and comparison of TSP data nor does it account for PNL's Environmental Monitoring Program.

237. -- Missing data are used to support the conclusion, "Except for ^{3}H and nitrate in 1987, levels of contaminants of potential

concern measured downstream ... are not significantly different ... from levels measured upstream of the Hanford Site."[24]

238. -- Emphasis placed on conclusions from a 1954 study[25] are unfounded and totally disregard data and conclusions from more modern, current studies. Rather than providing quantitative data, only general statements are cited, e.g., "these isotopes accumulated in aquatic organisms" [which, how much?] and "measurable quantities of radioisotopes were entering the public drinking-water supply" [which, how much?].

239. 2.2.2.2. Riverbank Springs

-- Geologic mapping of the seeps and springs on-site has not been carried out. This task was included in the preliminary agreement on scope for the M-30-01 milestone because of the inadequacy of available data, but was not completed.[26] As a result, we have no reliable data regarding the location and flow rates for the springs that have been sampled, and no assurance that samples currently available are representative of the overall hydrological regime for the Hanford Reach area.

240. -- Consequently, the CTUIR staff strongly disagree with the comment provided on pg. 33, "groundwater discharges to the river cause localized impacts on a small scale." No evidence regarding the type or size of the localized area or scale of the impact has been presented.

241. Section 2.2.3, Ecological Contamination

-- The document states that environmental monitoring and scientific studies have been carried out for over 45 years,[27] yet fails to provide an adequate summary of these data. The Plan fails to provide summary information on ecological contamination in shellfish, benthic organisms, amphibians, reptiles, waterfowl or terrestrial organisms. Nor is there an analysis comparing the reported data with available historical data.

242. -- This section needs to present a more thorough and complete review in order to support the conclusion: "Environmental studies and monitoring to date have not shown, however, that the observed contaminant concentrations have resulted in any significant adverse impact to the Hanford Reach ecosystem."[28] This

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[24]Ibid., Page 24.

[25]Ibid., Page 32.

[26]EPA correspondence, "Technical Review of DOE/RL-92-12", 4/2/92.

[27]Columbia River Impact Evaluation Plan, DOE/RL-92-28, Revision 0, Page 68.

[28]Ibid., Page 38.

conclusion is unwarranted and cannot be substantiated on the basis of the information provided.

243. -- The CTUIR agrees with the following statement, "... it should be noted that fish are mobile within the Hanford Reach and the opportunistic sampling methods used by the Environmental Monitoring Program may be insufficient to detect impacts."[29]

244. **C. Chapter 3 Review**

This chapter provides a cursory analysis of fate and transport for the "contaminants of potential concern" identified in Chapter 2. As noted above, the CTUIR disagrees with the selection process used to determine contaminants of potential concern. The following additional deficiencies are noted for Chapter 3.

-- The computational model developed in the CRIEP fails to consider all potential contaminant pathways. As noted earlier there is no justification for not including the "skyshine"[30] exposure pathway.

245. -- The computational model fails to consider potential contaminant uptake and transport mechanisms by amphibians and reptiles.

246. -- The Plan needs to clearly state what criteria were used to assess the significance of the various pathways.[31] Of the 30 pathways presented in this model, only three are considered in the analysis.

247. -- The CTUIR staff disagree with the statement, "Potential impacts [from contaminated seeps and springs] would be limited to environmental receptors since human access to the 100 Area is limited by institutional controls. In addition, the seeps and springs are not always accessible, evident, or conducive to water collection."[32] River areas adjacent to 100 Area seeps and springs are easily accessible by boat. Although the springs and seeps may not always be "evident", this would seemingly increase future potential impact, rather than limit it. The conclusion regarding potential impact is unsubstantiated by the information presented.

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[29]Ibid., Page 37.

[30]Ibid., Page 12.

[31]There are a number of additional "direct exposure pathways" of importance to the CTUIR that are not discussed in the document. These include, but are not limited to, ingestion of contaminants via foraging and hunting activities, as well as the harvesting of food crops. If activities are assessed by the number of intermediate steps between contaminant and environmental receptor, these pathways are no less "direct" than those selected for discussion.

[32]Columbia River Impact Evaluation Plan, DOE/RL-92-28, Revision 0, Page 68.

248. -- The CTUIR disagrees with the conclusion, "it is not likely that any significant adverse downstream environmental or health impact associated with the river-water column would be extensive."[33] Statistical problems with the data used to support this conclusion are discussed in Chapter 2, above. Note also that the use of the term "extensive" is inappropriate, as no information relating to the extent of any significant adverse impact has been presented. Finally, the conclusion completely discounts localized effects associated with potential contamination from seeps and springs discharging contaminants to the surface-water pathway.

249. -- The document states, "potential environmental impacts were evaluated by considering contaminant uptake by fish and by comparing derived contaminant concentrations in the river to ambient water quality criteria."[34] It is unclear what data were used for the biotic pathway evaluation and there are no conclusions indicated as to the results of the research.

250. -- Regarding the white pelican study, it is stated in the CRIEP that because "recent environmental surveillance reports show no measurable influence on fish from radionuclides released to the Hanford Reach . . . . Thus, it is unlikely that white pelicans are . . . adversely impacted."[35] What data support this conclusion?

251. -- There are a number of additional threatened, endangered and sensitive species that should be taken into account in evaluation of biotic pathways. These should include both animal and plant species of concern; the complete omission of terrestrial and aquatic plants as potential biotic pathways is not acceptable. Studies should be conducted on less mobile organisms such as those more likely to be permanent residents of the Hanford Reach and on those that live, feed or burrow in the bottom sediments.

252. -- Section 3.3 states, "Contaminant transport is addressed below by subsurface, surface-water, and biological considerations."[36] What follows, however, discusses subsurface transport only. The entire sections on surface-water and biological considerations are missing from the document.

253. -- Section 3.3.1 states "Table 2-3 shows the estimated groundwater flow rates and source concentrations derived from

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[33]Ibid., Page 68

[34]Ibid., Page 42.

[35]Ibid., Page 42.

[36]Ibid., Page 43.

information in Appendix B."[37] This is incorrect; the referenced table appears as Table 2-2.

254. **V. Proposed Data Collection Activities**

On page 82 of the CRIEP, it is stated that "the consideration of spatial, ecological, temporal and administrative factors for any investigation points to an eventual need for characterizing the river on a programmatic basis." The CTUIR agrees that a collective and comprehensive environmental impact evaluation cannot be completed without such an approach. However, the CRIEP fails to meet this need.

255. Although Chapter 5 contained in the CRIEP attempts to provide guidance for future studies, the background information reported in the CRIEP is incomplete and the conclusions are selective at best. Therefore, the future study designs are suspect.

256. The tasks and activities planned for data collection should be designed to include an in-depth study into the impacts of historical Hanford operations on an ecosystem basis. As described earlier, additional indicator species such as amphibians need to be evaluated to better represent species and habitats that may be the most ecologically sensitive.

257. Amphibians are excellent candidates for bioassay because, due to their biphasic life history (ie., aquatic larvae and terrestrial adults), are exposed to contaminants in more that one media.

258. Additional studies are needed to fully understand implications of pathways other than those described in the CRIEP. It is insufficient to assess only the impact to fish. These studies would include human ingestion of waterfowl, venison, plants, irrigated crops, domestic livestock and other animal products.

259. Other studies need to be completed on the radiobiology of important fisheries resources. An understanding of interactions between contaminated sediments and the effects on both spawning and rearing juvenile fall chinook salmon, for example, is crucial in protecting and enhancing this tremendous natural resource.

260. The CTUIR recommends that the following studies be incorporated into or added to the tasks contained in the CRIEP to further define biological impacts of Hanford on the Columbia River environment:

1. Activity 1A-3 - Studies should include an assessment of sediment partitioning to determine impacts of ambient sediment conditions. Studies should be completed on whole sediment and interstitial water in conjunction with chemical/radiological analysis.

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[37]Ibid., Page 21.

Bioassays should include a variety of plant and animal indicator species to determine lethal and non-lethal end points and to define the link between contaminant uptake and concentration factors. These studies should also determine human exposure risk.

Long-term studies on the effects of nuclear waste materials that migrate from present storage sites and enter the Columbia River on fall chinook salmon and other salmonid species as well as sturgeon, whitefish, bass etc., need to be thoroughly studied.

Potential exposure scenarios need to be evaluated and data collected to determine effects of contamination on embryonic development, egg to fry survival and effects on juvenile fish species.

Evaluations need to be completed to determine the potential for contaminants to intersect and impact key fall chinook spawning areas in the Hanford Reach and downriver areas on the Columbia River. An example for the need of these studies is the previously described fuel rod failures and the rod fragments located in the Columbia River.

2. Activity 4-1 - data needs to be collected on the uptake, elimination and bioaccumulation in resident as well as migratory species. These types of assessments should include shorebirds, neotropical migrants, raptors and waterfowl such as the Canada goose as well as plant species.

3. Activity 4-2 - these activities should include studies to determine impacts on benthic communities as well as on organisms such as amphibians and reptiles.

4. Activity 4-3 - The CTUIR request that riparian species as well as upland and other terrestrial organisms be included in this activity.

261. **VI. Conclusions**

The CTUIR has a direct governmental interest in the environmental health of the Hanford Nuclear Reservation and in off-site resources affected by Hanford as well as Tribal community health and safety. Environmental restoration at Hanford and in downriver areas of the Columbia River is CTUIR's top priority for protecting treaty rights and in protecting and restoring the natural resources upon which the CTUIR's treaty-rights are based.

262. Concern exists with the CRIEP because it does not adequately provide a comprehensive overview of the impacts on the natural environment. Concerning the contaminant pathway analysis, the CTUIR believes that DOE's assessment of the environmental impacts contained in the CRIEP are incomplete. The CRIEP falls short of evaluating the ecological data gaps because the study fails to

integrate other research activities and focuses on only the surface water pathway. The CRIEP presents a narrowly defined human receptor pathway and does not adequately evaluate other pathways.

263. The exclusion of other pathways does not fulfill the requirements of a comprehensive cumulative impact evaluation nor does it set the stage for future impact evaluations.

264. Chinook salmon are used as the primary indicator in evaluating human exposure to contamination in the CRIEP. Tribal members of the CTUIR utilize a variety of aquatic and upland terrestrial organisms and numerous vascular plants for subsistence. These resources represent pathways of potential contamination and should be considered in any cumulative impact assessment.

265. Many organisms indigenous to the Hanford area that are extremely sensitive to contaminants are ignored. For example, amphibians, macroinvertebrates and vascular plants associated with wetlands and backwater sloughs may be subject to higher concentrations of contaminants due to deposition of contaminated river sediments. Organisms residing in these areas may be more representative of the impact caused by Hanford than more mobile organisms and are generally considered more appropriate biological indicator species. These species would more accurately represent the magnitude and extent of contamination from Hanford operations, yet they receive only a cursory examination in the CRIEP.

In summary, simply evaluating the surface water of the Columbia River and predicting environmental impacts based solely on this information is inappropriate. The TPA itself states that a comprehensive evaluation of the Columbia River is the intent of this CRIEP. Clearly, this CRIEP does not fulfill these goals.

BIBLIOGRAPHY

Blaustein, A. R., and D. B. Wake. 1990. Declining amphibians: A global phenomenon? Trends In Ecology and Evolution 5:203-204.

Devillers, J., and J. M. Exbrayat. (Eds.). 1992. Ecotoxicity of Chemicals to Amphibians. Gordon and Breach Science Publishers, Philadelphia.

DOE-RL. 1992. RCRA Facility Investigation / Corrective Measures Study Work Plan for the 100-HR-3 Operable Unit, Hanford Site, Richland, Washington. DOE/RL-88-36, Rev. 0. U. S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL. 1993. Hanford Site Baseline Risk Assessment Methodology. DOE/RL-91-45, Rev. 2. U. S. Department of Energy, Richland Operations Office, Richland, Washington.

Eisler, R. 1986. Chromium hazards to fish, wildlife, and invertebrates: a synoptic review. Biological Report 85(1.6), U.S. Fish and Wildlife Service, Laurel, MD. 60pp.

Fitzner, R. E., and R. H. Gray. 1991. The status, distribution and ecology of wildlife on the U. S. DOE Hanford Site: A historical overview of research activities. Environmental Monitoring and Assessment 18:173-202.

Goller , E. (DOE-RL). 1992. Memorandum of August 18 to S. Cross (Ecology) and L. Gadbois (EPA): DOE-RL responses to Ecology comments to the "Columbia River Impact Evaluation Plan, Draft A," DOE/RL-92-28.

Gray, R. H., and W. H. Rickard. 1989. The protected area of Hanford as a refugium for native plants and animals. Environmental Conservation 16:251-260, 215-216.

Schmitt, C.J., and W.G. Brumbaugh. 1990. National Contaminant Biomonitoring Program: Concentrations of arsenic, cadmium, lead, mercury, selenium, and zinc in U.S. freshwater fish, 1976-1984.

Shacklette, H.T., and J.G. Boerngen. 1984. Element concentrations in soils and other surficial materials of the conterminous United States. U.S. Geological Survey Professional Paper 1270. 105pp.

Weiss, S. G., and R. M. Mitchell. 1992. A synthesis of ecological data from the 100 Areas of the Hanford Site. WHC-EP-0601. Westinghouse Hanford Company, Richland, Washington.

WHC-SD-EN-TI-037. Summary of the geology of the 200-BP-1 Operable Unit. July, 1992. K.M. Hoffmann.

Appendix A. PARTIAL GLOSSARY OF TERMS AND ACRONYMS

100 Area	The northern portion of Hanford along the southern and western shore of the Columbia River. Site of the nine nuclear reactors.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (commonly referred to as "Superfund")
CFR	Code of Federal Regulations
CTUIR	Confederated Tribes of the Umatilla Reservation.
CRIEP	Columbia River Impact Evaluation Plan
DOE	U.S. Department of Energy. Also denoted as DOE-RL or DOE/RL. The "RL" denotes the Richland, WA facility.
DOH	Washington State Department of Health
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
M-30-02	TPA milestone that required DOE to "Submit a plan (primary document) to EPA and Ecology to determine cumulative health and environmental impacts to the Columbia River, incorporating results obtained under M-30-01" by May, 1992. Note: M-30-01 evaluated the impact from contaminated springs and seeps along the 100 area of the Columbia River.
MTCA	Washington State's Model Toxics Control Act
Qualitative Risk Assessments.	An analysis (not necessarily quantitative) that is based on the minimal amount of information necessary to justify and support a remedial action.
RCRA	Resource Conservation and Recovery Act
R.C.W.	Revised Code of Washington
TPA	Tri-Party Agreement (Federal Facility Agreement and Consent Order for Hanford)
USFWS	U.S. Fish and Wildlife Service

V. ADDITIONAL PUBLIC COMMENTS

The following comments were provided by the Nez Perce Tribe during the origional public comment period. A revised and expanded set of comments is expected soon. They will be forwarded to DOE upon arrival.

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FAX TRANSMISSION

DATE: 8/5 TIME: 5:11 # PAGES: 16

TO: Larry Gadbois
LOCATION: USEPA
FAX#: (509) 376-2396
MESSAGE:

FROM: Stuart Harris
LOCATION: Nez Perce Tribe
FAX#: (208) 843-7378
PHONE#: 843-7375

To Larry Gadbois
U.S.E.P.A.
712 Swift Blvd.
Suite 5
Richland, Washington 99352

Following are selected comments on the Columbia River Impact Evaluation Plan. Each comment is preceded by an indented reference with the following format:

Page # Paragraph #: Sentence #

Thank you for the opportunity to comment on this document.

Sincerely

Stuart Harris
Enviornmental Specialist
Nez Perce E.R.W.M.

1.0 Introduction

Page 1 Paragraph 1

This paragraph establishes the concept that this document is bound by the CERCLA, RCRA, and Tri-Party Agreements.

Page 1 Paragraph 2

This paragraph establishes the milestone's concept and the requirement for ensuring acceptable progress for Hanford in compliance with CERCLA, RCRA, and Tri-Party requirements.

Page 1 Paragraph 3: Sentences 2&3

These sentences establish that this is a preliminary evaluation to assess the adequacy of existing data and proposed data collection activities.

1.1 Purpose and Objectives of the Report

Page 1 Paragraph 2: Sentence 1

Where is Milestone M-30-01, and why is it not listed in the references?
This statement does not agree with **Page 1 Paragraph 3: Sentences 2&3**.

Page 2 Paragraph 1: Sentence 2

Is the evaluation referred to supposed to be M-30-01?
This shows the establishment of CERCLA guidelines for scientific data collection.

Page 2 Paragraph 1: Sentence 3

This sentence establishes the guidelines for adequate characterization of exposure pathways, and contaminants.

Page 2 Paragraph 1: Sentence 4

Quantification means: to determine or express the quantity of. Should this word be qualify, or be a qualitative assessment?

Page 2 Paragraph 2: Sentence 2

This sentence establishes the plan to evaluate the impacts for 100 area risk assessment.

Page 2 Paragraph 3: Sentence 1

This sentence establishes the criteria for the study.
The reference M-30-00 is missing in the Bibliography.

Page 2 Paragraph 3: Sentence 2

This sentence establishes the need for controls.

Page 2 Paragraph 3: Sentence 4

This sentence establishes that samples were taken at the city of Richland, and establishes that 94 km of river was tested for human ingestion of fish.

Page 2 Paragraph 4: Sentence 2

This sentence establishes that there is no quantitative assessment.
This statement is in conflict with the previous statement on **Page 2 Paragraph 1: Sentence 4.**

1.2 Impact Evaluation Approach

Page 2 Paragraph 5: Sentence 2

Does the NCP supersede the guidance of CERCLA, RCRA, or ECOLOGY? If not why was it mentioned?

Page 2 Paragraph 5: Sentence 3

There needs to be a specific reference to time here for this statement to be scientifically valid. Controls can become biased if the reference parameters are restricted, thus, the items in parentheses need to be deleted or changed.

Page 2 Paragraph 6: Sentence 1

This sentence establishes the scope and what is to be included in this document.

Page 3 Paragraph 1: Sentences 4 & 5

These two sentences are not in agreement with **Page 1 Paragraph 3: Sentence 2.**

Page 3 Paragraph 1: Sentence 6

This sentence establishes the fact that except for the 1989 data set, the rest of the data sets are incomplete. This raises the question of the methodology used, scientific repeatability, quality assurance and quality control under the Tri-Party Agreement.

Page 3 Paragraph 1: Sentence 8

This document was published June 1993. If the data sets are incomplete as late as 1992, the methodology of statistical data gathering including the 1989 data set are in question.

Page 3 Paragraph 2 Item 1: Sentence 2

What is the primary standard to be used? The CERCLA, RCRA, Tri Party Agreement Regulations or the NCP? Which one is to be used, ambient water quality, drinking water quality, or Class A (Excellent) surface water body standards? Does the identification approach take into account the geochemistry of the systems including the decay products, mass balance, pH, Eh, reactivity, exchange capacity of the aquifer, speciation effects, temperature, or time?

Page 3 Paragraph 3 Item 2: Sentences 2 & 3

These sentences establish the need for identification of the major components of the Hanford Reach Ecosystem and the likely pathways.
They also establish the inclusion of the Hanford Reach Ecosystem components if the Columbia river is identified as the primary transport medium.

Page 3 Paragraph 4 Item 3: Sentences 2 & 3

The contaminants of potential significant adverse effects have not been established. These sentences establish the identification of exposure pathways and listing of several paths, but does not list time, geochemistry, transformation products, temperature, pH, Eh, reactivity, speciation, subsurface geology, ion mobilization, or other significant aspects for evaluating contaminant pathways.

Page 3 Paragraph 5 Item 4: Sentences 2 & 3

Have the selected exposure pathways have been judged? If so, by who, at what time, and using what methods? These threats to human health and the environment were evaluated using the NCP risk assessment. Were they supposed to be assessed according to EPA guidelines, or other guidelines? There is a standardization problem with which guidelines to be followed.

Page 3 Paragraph 6 Item 5: Sentences 2 & 3

These sentences establish the need to identify and summarize the data gaps.

Page 3 Paragraph 7 Item 6: Sentence 2

The word "adequate" needs further defining in terms of the Tri-Party agreement, CERCLA, RCRA regulations and the Endangered Species Act.

Section 1.3 Relevant Environmental statutes, Regulations, and Guidance

Page 4 Paragraph 1: sentence 2

This sentence establishes that the document is bound by CERCLA, RCRA, and Washington State statutes Model Toxics Control Act and the Hazardous Waste Management Act.

This section does not include the Tri-Party agreement and the Endangered Species Act.

Page 4 Section 1.4 Document Organization

Page 4 Paragraph 6: Sentence 1

A summary of the preliminary impact evaluation results is already supposed to have been done with the completion of Milestone M-30-01. This statement is out of context.

Section 2.0 Characteristics and Nature of Contamination in the Hanford Reach Vicinity

Page 5 Paragraph 1: Sentence 4

It would also be expected that any adverse impacts would occur in the sediments lying in the low energy pools not only downstream but cross stream due to sediment transfer.

Section 2.1 Physical Setting of the Hanford Reach

Page 5 Paragraph 2: Sentence 1

This sentence establishes the importance of the Hanford Reach.

2.1.1. Environmental Characteristics

Page 5 Paragraph 3: Sentence 5

This sentence establishes the Importance of the river for spawning salmon and steelhead trout which spawn in the gravel of the river bed.

Page 5 Paragraph 4: Sentence 5

This statement does not make allowances for temperature extremes that dominate the climate. The daily temperature can make a large difference in the solubility of the reactability of all of the constituent contaminants and the transporting medium. The local wind direction is extremely variable and also needs to be taken into affect.

Page 6 Figure 2-1

The legend is not complete. This map of the Hanford Site is not the map to use if you reference such sites as the McNary Dam and the Priest Rapids Dam (**Page 5 Paragraph 3: Sentence 1**). The arrow above the words YAKIMA RIVER is very misleading, what does it indicate, secondary wind direction, north, or current flow? The arrow near the words COLUMBIA RIVER has the same effect as the previous mentioned arrow. The arrows are not listed in a legend box, along with typical map items you would expect to find such as bridge symbols, boundary symbols, and feature pointers, this is not standard cartographic nomenclature. Because there are islands depicted in the river channel there should be some references to the current flow and sediment transport patterns, due to the earlier reference **Page 5 Paragraph 4: Sentence 5** that the area is important for spawning salmon and steelhead fish.

Page 7 Paragraph 1: Sentence 6

The word "significant" needs to be further defined in terms of operational changing of the ecology, with a comprehensive description of the baseline ecology.

Section 2.1.3 Hydrological Characteristics

Page 7 Paragraph 4: Sentence 2

This sentence establishes the fact that the Columbia River is the fifth largest river by volume in North America.

Page 7 Paragraph 4: Sentence 5

Converting cubic meters to cubic miles is not a standard conversion and is cumbersome. The most common usage is in acre-feet .

Page 7 Paragraph 4: Sentence 6

Because of the importance of the river mentioned on **Page 5 Paragraph 4: Sentence 5**, the reference to the amounts of water that pass by the Hanford Reach, there should be a description of the hydrological characteristics, including, quantitative geomorphology, role of river bars, stability of sediments, and bedload characteristics.

Page 7 Paragraph 5: Sentence 2

The conversion for 1020 M^3 /s is not 36,000 ft^3 /s it is, more correctly 36,021 ft^3 /s keeping with the standard significant figure. Why was cubic feet used instead of gallons per minute?

This sentence also establishes the variability of the significant flow rate.

Page 7 Paragraph 5: Sentence 3

The sentence does not mention where the rates are recorded nor does the rates agree with the statement in **Page 7 Paragraph 4: Sentence 6.**

Page 7 Paragraph 5: Sentence 4

Establishes the fact that the lowest mean flow rates occur during the months of September and October precisely during the time of the spawning of the fall Chinook Salmon as referenced on **Page 5 Paragraph 3: Sentence 5.**

Page 7 Paragraph 5: Sentence 4

Which low annual flow rate is supposed to be the rate to be used in a study for determining the baseline ecology, the rate mentioned at **Page 7 Paragraph 5: Sentence 2**, or the rate mentioned in this sentence?

Page 8 Paragraph 1: Sentence 2 & 3

Longitudinal bars are a primary indicator of non-stable river channels indicating the river is actively moving sediments irrespective of the dams or the dam practices. The indication that the river channel is relatively stable does not apply here, especially without the use of a time parameter.

Page 8 Paragraph 1: Sentence 4

Where are the references for this determination?

Page 8 Paragraph 1: Sentence 5

Indicating the existence of low energy areas implies there are references to support this sentence. This also leads to the acknowledgment that the contaminants (many are heavy metals) would migrate to areas such as those mentioned.

2.1.4. Ecological Characteristics

Page 8 Paragraph 2: Sentence 1

The definition of riverine is anything pertaining to or formed by a river, not just the channel to the high water mark.

Page 8 Paragraph 2: Sentence 2

The term "unaltered" is inconsistent with the statement referenced on **Page 7 Paragraph 1: Sentence 6.**

Page 8 Paragraph 2: Sentence 3

This sentence establishes the reference to the term "lacustrine" indicating the study encompasses the lacustrine environment including the lacustrine sediments.

Page 8 Paragraph 2: Sentence 4

The term "Littoral" specifically pertains to the benthic ocean environment or depth zone between high water and low water; also; pertaining to the organism of that environment. A synonym for littoral is inter tidal which is inconsistent with the statement on **Page 5 Paragraph 3: Sentence 2.** Seasonal and impounded is repeated.

2.1.4.1 Riverine Zone

Page 8 Paragraph 4: Sentence 1

This is an incomplete definition in terms of this document.

Page 8 Paragraph 5: Sentence 2

This sentence establishes that the organisms develop on riverbeds.

Page 8 Paragraph 5: Sentence 3

This sentence establishes that the phytoplankton and the periphyton are food sources and are the origins of the food chain in the Hanford Reach.

Page 9 Paragraph 2: Sentence 2 - 4

This sentence is another reference to the importance of the spawning salmon.

Page 9 Paragraph 5: Sentences 1 & 2

This statement establishes that the river must be maintained by yet another regulation.

Section 2.1.4.2 Riparian Zone

Page 9 Paragraph 6: Sentence 1

The term "fast moving water" needs to be quantified, how fast, in what direction, and are there eddies?

Page 9 Paragraph 6: Sentence 3

The Endangered Species Act has not been mentioned and especially should be at **Page 4 Paragraph 1: Sentence 2.**

Page 9 Paragraph 7: Sentences 1 & 2

Are the terms "shore substrate" and "cobble and gravel substrate" being used appropriately in the sense of ecological terminology or does the term "cobble and gravel substrate" explicitly referring to a mapped subsurface unit?

Page 10 Paragraph 1 Sentence 1

This sentence does not agree with the statement on **Page 8 Paragraph 2: Sentence 2.**

Page 10 Paragraph 4: Sentence 1

The endangered species act has not been mentioned and especially should be at **Page 4 Paragraph 1: Sentence 2.**

2.2 Nature and Extent of Contamination

Page 10 Paragraph 6: Sentences 2 & 3

To adequately assess the ground water flow the wells, data should be supplied as to the well construction, depth, and inter-well subsurface geology correlation's.
The well positions need to reflect a distinct correlation to the subjects being monitored, the well spacing on **Figure 2-2** , do not.
The legend is incomplete, and the map has not been adequately detailed or labeled.
Are the wells bottomed out in the same subsurface unit?

Page 12 Paragraph 1: Sentence 1

The term "soil" indicates that the subsurface has been determined, and that the contamination products flowed through distinct horizons. The term "current primary pathway" indicates that the subsurface has been adequately mapped and modeled.

Page 12 Paragraph 2: Sentence 1

Why were only the major chemical and radiological contaminants listed? This is not an inclusive list. Elements that should have been included are Rubidium (^{86}Rb), Ruthenium (^{106}Ru), and Cesium (^{137}Cs).

Page 12 Paragraph 2: Sentence 2

Designating the nitrate ion and Tritium as the indicator species for "conservative" ground water movement does not take into account the geochemistry involved with the interaction of competing ions and the sorptive properties of a major subsurface constituent, montmorillonite.

Page 12 Paragraph 2: Sentence 5

The term "soil column" is used in the context that the discharges were done to a unique soil stratigraphic unit, when in fact the act of trenching removes some or all of the soil. The term "soil column" also refers to a homogenous unit with non-distinguishable inter-units. The aquifer has not been adequately defined in terms of consistency, pore space, lithology, pH, Eh, geochemistry, or subsurface geomorphology. Nowhere is the mention of the distribution coefficients for each of the elements, along with the cation exchange capacity, the selectivity quotient and the total competing cation concentration. This information is essential to determine the effects of how the distribution coefficients are affected by ion exchange, precipitation, substitution, redox reactions, and acid-base buffering. The movement of the elements through the subsurface needs to be adequately explained.

Page 12 Paragraph 2: Sentence 6

The plume maps are not complete enough pertaining to controls showing what is indicated in this sentence. For example the well positioning does not reflect ground water movement as indicated in the water table diagram.

Page 12 Paragraph 3: Sentence 1

Which standards are used? Who determined which standard to use? Why are the results of Evans et al. regarded as the standard for determining what is and what is not the contaminant of potential concern? Why weren't the standards used for the endangered species act used?

Page 12 Paragraph 3: Sentence 2
This list is not complete and doesn't reflect the most basic of geochemistry modeling for the contaminants listed in the partial list on **Page 12 Paragraph 2: Sentence 1**. The more stringent regulations would have listed more, not less elements of concern not to mention ^{137}Cs, ^{86}Rb, ^{106}Ru,^{95}Mo, ^{60}Co, and all of the daughter products from the decay of uranium including radium.

Page 12 Paragraph 4: Sentence 4
Ground water discharge is not a standard term and does not reflect actual ground water movement in terms of rates.

Page 12 Paragraph 5: Sentence 1
Table 2-1 does not show the mean, standard deviation, and range for contaminants of potential concern. It shows Draft Clean-up Levels for drinking water, chronic aquatic and ground water. The title itself is misleading in terms of language, who set the levels? The best option from this table is obviously the chronic aquatic.

Page 12 Paragraph 5: Sentence 2
This is not a statistical table.

Page 12 Paragraph 5: Sentence 3
This sentence is an indicator of the degree of quality of statistical sampling. Where are the controls on the Quality Control? How were the instruments calibrated, the samples taken, by who, at what time, at what location, at what depth, at what temperature, at what salinity, at what pH, Eh? The document needs to be more explicit about this type of information. How can the "statistics" show even a generalized indicator of plume characteristics let alone an indicator of ground water quality, when most of the essential information gathering techniques are left out?

Page 13 Figure 2-3
The legend is incomplete. A solid line is an indicator of a high degree of certainty to within meters, yet the wells which provide the controls are up to kilometers apart. There is a dilution error by using wells not in the suspected plume.

Page 14 Figure 2-4
The legend is incomplete. A solid line is an indicator of a high degree of certainty to within meters, yet the wells which provide the controls are up to kilometers apart. The designation of generalized basalt indicates the basalt may or may not be at the location designated by a solid line depicting a high degree of certainty to within meters and the controls are not within that degree of accuracy. The distribution of the most recent wells indicates that the subsurface has not been explained as to the subsurface gradient, otherwise why sink so many wells up gradient from the suspected contaminant plumes? Instead of using a map of this scale, it would have been as easy to produce a larger scale map with 10 times the detail, depicting river currents, well depths, subsurface features, and buried river channels.

Page 15 Figure 2-5
This picture is too simplistic for use in a document dealing with endangered species. This is an inadequate characterization that doesn't accomplish the flow directions from the gradient contours (Page B-4 Figure B-3).

Page 20 Paragraph 1: Sentence 1

Why was the data used restricted to 1989? Based on what has been presented so far, the deletion of data because of incompleteness would seem to be in order. The intentional dumping of radioactive waste began in the 1940's until the 1970's. The study needs this additional information in order to accomplish the objectives, that being a comprehensive evaluation. There should also be dates for the actual data collection, and a complete Quality control assessment on the standards.

Page 20 Paragraph 1: Sentence 2

What was the procedure for estimating the flow rates? What was the source? Was there a mass balance calculation done for each contaminant? Because the rates are estimated, what is the amount of error involved? How was the maximum rates found? How long of time period was the rates measured? Were there any other contaminants found? What were their concentrations? What was the depth of the wells? What was the depth of the samples? What was the type of aquifer the samples were taken from? What was the porosity? What was the mineralogy? Were the samples taken at the same time of year/day? What was the distance from the source? Where are the locations of the other wells used in determining the 'data'?

Page 20 Paragraph 2: Sentence 2

Is there a valid reason for evaluating a structure such as a subsurface plume when the data presented so far is at the very least incomplete?

Page 20 Paragraph 2: Sentence 3

The contaminants identified are not sufficient for adequate identification, and tracking in terms of a proper evaluation. The document has not provided proper information to determine plume characteristics in terms of ground water movement or geochemistry.

Page 20 Paragraph 2: Sentence 4

The Hanford Site Baseline Risk Assessment was supposed to be done already. The screening process needs to be thorough yet comprehensive.

Page 20 Paragraph 4: Sentence 2

The time factor makes a difference in the ground water flow rates. What was the sampling process, at what times, from which springs, and by who?

Page 20 Paragraph 5

The document failed to take into account sulfates, transformations, complexations, especially as some complexants are as toxic as their parent compounds. The geochemical environment was not considered leaving out important information such as pH, Eh, and temperature.

Page 20 Paragraph 6: Sentence 2

How is it evident that NO_3 is associated with the reactor discharge? Where are the maps depicting this?

2.2.1.2 Radiological Contaminants

Page 20 Paragraph 7: Sentence 2

The most mobile radiological contaminant present is Ruthenium 106 determined in 1971 by Matthes (Matthes; Properties of Ground water; 1980; harper and sons;nyny page 96). The most mobile element really depends on many factors most of which have not been mentioned, such as pH, Eh, transmissitivity, adsorptive qualities of the clays in the particular aquifer and much more. To make a statement on what the most mobile elements are, without any documentation seems farfetched. The ^{3}H may actually only provide a basis on recharge rates, you cannot tell based on the information presented so far.

Page 21 Figure 2-2

What does the last column on the right side mean? Are the estimated flow rates actually draw down rates? What are the basis for these figures? Why did the authors choose to use L/min. when the standard notation for ground water is in feet per day? How was the maximum source concentration calculated, were there any mass balance calculations on the constituents, what was the well spacing?

Page 22 Paragraph 1: Sentence 1

Where on the spring were the samples taken, by who, at what time of year, with what type of methodology, and what was the matrix of the spring aquifer?

Page 22 Paragraph 3

What were the daughter products detected, i.e. Radium. Why was the big picture (namely the public) left out, at the discovery of uranium entering the river? Was speciation and adsorption's within the aquifer taken into account? Why is there no description of interaction between the elements?

2.2.2 Surface Water Contamination

2.2.2.1 Hanford Reach

Page 22 Paragraph 5: Sentence 6

How much contamination has leaked through the pipelines, at what locations, and were there any monitoring wells? Were there any injection wells on the Hanford Reach?

Page 22 Paragraph 6: Sentence 1

This is not a complete list. Were the material safety data sheets (MSDS) for each operation looked at?

Page 22 Paragraph 6: Sentence 2

This is not a sufficient list. The magnitude of comprehensive evaluations that are to be done in order to satisfy Milestone M-30-02 as listed on **Page 1 Paragraph 6: Sentence 1**, would dictate that all the pertinent information be used.

Page 22 Paragraph 6: Sentence 5

What additional contaminants are being referred to here? Are there direct discharges to the river that have not been discussed in this document?

Page 23 Figure 2-3 and Figure 2-4

In addition to the curies, what was the quantity of materials involved? This table represents a significant source of radionuclides with no ion sizes, charges, or reactivity coefficients. The source material has not been referenced and the methodology for determining how these figures came about has not been referenced.

Page 24 Paragraph 2: Sentence 1

What were the methods used in collecting the samples? Were the samples taken at the same time of year? Were the samples taken at the same place, at the same depth, by the same person(s)?

Page 24 Paragraph 2: Sentence 2

If the samples were not tested for all of the constituents the amount of error for the study will outweigh any attempt to quantify the results.

Page 24 Paragraph 2 Sentence 4

The ability to identify individual radionuclides has been available since the 1970's. Why has this information not put to use.

Page 24 Paragraph 3: Sentence 2

The table on **Page 25 Table 2-5** is not complete, yet the statement on **Page 24 Paragraph 3: Sentence 2** clearly indicates that this provides quantitative data. The amount of error outweighs the quantity of results. This is not a valid statement.

Page 24 Paragraph 3: Sentences 2 and 3

Were the chemical tests taken at the same time period? Were the tests taken at the same sites? What was the methodology used for the sampling? The geochemistry of the river has not been taken into account. The sampling stations are not representative for the amount of area the river covers. The statement on **Page 5 Paragraph 3: Sentence 1**, Clearly states that there is 58 miles of Hanford reach. The statement on **Page 8 Paragraph 1: Sentence 5** states that there are low energy areas in the river yet the sampling stations do not take this into account. The sentence on **Page 7 Paragraph 4: Sentence 6** states that daily flow rates can vary from 1000 m^3/s to 7000 m^2/s. Have the flow rates been taken into account? If the flow rates have been taken into account, where are they? The reported results do not allow for adequate evaluations to be used for the purpose of ensuring adequate progress toward Hanford Site compliance with CERCLA (**Page 1 Paragraph 2: Sentence 2**).

Page 24 Paragraph 3

This paragraph indicates that the methodology in the Hanford Site Environmental Reports are to be questioned seriously about any validity.

Page 24 Paragraph 4: Sentence 2 (Bullet 1)

The figures do not illustrate that the levels of contaminants are decreasing because the data is incomplete, and are not adequate to infer any type of trends.

Page 24 Paragraph 4: Sentence 3 (Bullet 2)

Because the data is not significantly different, is this due to chance, or to sampling procedures? Have other tests been used such as the x^2, or the Z test?

Page 24 Paragraph 5: Sentence 1

The data does not support a conclusion of this magnitude in light of the importance of this document.

Page 28 Figure 2-6

Because the nitrate ion is conservative and moves with the water, why is there a peak? Was there an error in the sampling, or was the locations variable? What was the time of year? Was there any quality assurance involved? The figure does not depict any trends, especially since the samples were taken at non-representative stations at variable times.

Page 29 Figure 2-7

Because there are admitted gaps in the data collection (**Page 24 Paragraph 4: Sentences 3 and 4**) the sampling methodology is in question. What is important is not the "quantitative" view but the qualitative view, i.e. the overall concentration is important.

Page 30 Figure 2-8

The 1990 concentration amount is not significantly different from the 1976 concentration amount. Why have the decay products not been taken into account?

Page 31 Figure 2-6

How is the river flow rates taken into account with this chart?

Page 32 Paragraph 4: Sentence 4

River sampling was done only once during this study. Why weren't the sediments sampled? There were only two sample sites listed. Does this means that a one time shot with two samples is what the evaluation is based on?

Page 32 Paragraph 5: Sentence 2

What were the methods involved in terms of evaluating the relative volumes between the springs and the river? Did the sampling include any sediment sampling? How many samples were taken? Where where they taken? Where there more than two samples taken?

Page 32 Paragraph 5: Sentence 3

This sentence establishes that there are radionuclides exiting from springs along the river. If the Dirkes study found results that indicated that radionuclides were in fact entering the river, why was there no follow up examination on the sediments? Many of the radionuclides do not float, thus, do not add up significantly in samples taken from the top of a water column. The results should have been oriented towards the chronic aquatic levels. The term "negligible" is a qualitative statement based on what parameters? Is this "negligible" discharge applicable to spawning steelhead and salmon?

Page 32 Paragraph 5: Sentences 4 and 5

The 7,279 pCi / L. would not be negligible to a person who is swiming near the spring. Both samples were nearshore, please define "nearshore" in terms of distance, depth, and river bed composition.

Page 32 Paragraph 5: Sentence 6 - 8

This spring is one tenth of a mile or about 161 meters downstream from the previously mentioned stream. What was the sampling distance from the shore, the depth, and the riverbed composition.

Page 32 Paragraph 5: Sentence 9

The river has a large volume, but the solution to pollution is not dilution.

Page 33 Paragraph 1: Sentence 1

Where are the locations for these samples, at what depth, and at what time of year were the samples taken?

2.2.2.2 Riverbank Springs

Page 33 Paragraph 2: Sentence 2

The term "relatively" needs to be defined. The springs are called intermittent, Where is the references for this? Where is the information depicting the actual aquifer dimensions? Does the springs discharge extend out into the riverbed?

Page 33 Paragraph 2: Sentence 3

This statement reflects a casual attitude towards the hydrological cycle, when in fact there are many readily available sources that tell us that 98% of a rivers water is derived from ground water.

Page 33 Paragraph 5: Sentence 2

Where is the data for this observation?

Page 33 Paragraph 5: Sentence 3

Did these tests include lower water column sampling, or bed load sampling?

2.2.3 River - Sediment Contamination

Page 33 Paragraph 6: Sentence 1

How did this statement become quantified as to the amount of contamination present? Where were the samples taken, at what depth, and at what time of year?

Page 33 Paragraph 6: Sentence 2

Intermittant sampling at odd intervals is poor methodology in scientific reasoning.

Page 34 Table 2-7

This table is not valid from a scientific standpoint.

Page 35 Paragraph 1: Sentences 3 -5

There is not enough data statistically to make assumptions, especially using only four samples and referencing poeple who did not provide sediment sampling reports. Why use the word "probably"? Does this mean you are not sure, or that you don't know, or that the results are worse than you want to report?

Page 35 Paragraph 2: Sentence 1

Where are the sample locations? Are they representative for the stream morphology?

Page 35 Paragraph 2 Sentence 4

Without the use of reference samples, how is the basic premise of scientific methodology to be validated? This is not the quality of documentation the taxpayers expect and deserve.

Page 35 Paragraph 4: Sentence 5

What was the basis for the conclusion in this statement? There is no evidence that the sediments will be diluted. The statement is technically incorrect.

Page 35 Paragraph 5: Sentence 1

Who selected the sites for sampling? What was the criteria? Was qualitative geomorphology taken into account?

Page 36 Paragraph 1 Sentence 1

Were these samples taken on dry land? At what time of year?

Page 36 Paragraph 2: Sentence 2 (Bullet 2)

How could there be areas of increased concentration when the river dilutes the concentration as the statements on **Page 32 Paragraph 5: Sentence 9** and **Page 33 Paragraph 5: Sentence 3**.

Page 36 Paragraph 2: (Bullet 3)

This paragraph does not make sense. Were the metallic flakes determined through aerial surveys? The presence of metallic ^{60}Co swirling around in the drinking water for lots of poeple and the environment to injest is a staggering idea.

2.2.4 Ecological Contamination

Page 36 Paragraph 4: Sentence 4

Radioactive materials have been determined to cause known adverse effects on the environment and all that resides in it.

Page 36 Paragraph 5: Sentence 2

The free floating plankton are the bottom of the food chain.

Page 36 Paragraph 5: Sentence 3

Where are the data for this statement? Where were the samples taken, by what method, and at what time?

Page 36 Paragraph 5: Sentence 4

The use of the term "biodilution" cannot be substantiated with the data that has been provided. The term " biodilution" is not valid according to current scientific opinion (try looking this term up in a current biology reference).

Page 37 Paragraph 2: Sentence 1

The term "opportunistic sampling" is another term for fishing isn't it? How many fish were caught, at what locations, and at what depth? This is not a very comprehensive sampling method for such an important document. Does the information from the fish obtained, provide a method for ensuring adequate progress under the regulations as listed on **Page 1 Paragraph 2: Sentence 2?**

Page 37 Paragraph 2: Sentence 4

Why was wet weigh used instead of dry weight?

Page 37 Paragraph 2: Sentence 5

Where were the fish caught, at what time of year, and at what depth?

Page 37 Paragraph 2: Sentence 6

Are the regulations under the Tri-Party Agreement for quality assurance and quality control being followed here? Why are these methods i.e. opportunistic sampling and using wet weight being used as the best methods for such an important document?

Page 37 Paragraph 3: Sentence 2

Because the Canada geese usually eat food out of the muds, and their eggshells were found to have ^{90}Sr, was this aspect further inspected? Were the sediments adequately tested for contaminants?

Page 37 Paragraph 3: Sentence 5

Were the collection methods used for waterfowl the same as those used for fish, namely, opportunistic sampling?

Page 37 Paragraph 4: Sentences 2 and 3

There is not enough data from one sample location to make inferences on levels of contamination, especially without reference samples.

Page 37 Paragraph 4: Sentence 4

Were the great blue herons themselve sampled?

Page 37 Paragraph 4: Sentence 5

Where did the authors get the reproductive data? Where the great blue herons tagged? What was the methodology?

Page 37 Paragraph 5: Sentence 4

The concentrations of these four elements remained constant through what? What was the levels of concentration? The paragraph's subject is on the food web.

Page 38 Paragraph 1: Sentence 3

Could the conclusion indicated on this sentence be a result of the data collection methodology?

3.0 Contaminant Fate and Transport

Page 39 Paragraph 2 Sentence 3

The analysis of contaminant transport is premature in the terms of the material presented so far.

3.1.1 Ground Water Pathways

Page 39 Paragraph 5: Sentence 2

This conclusion is not based on the information presented so far.

Page 41 Paragraph 2: Sentence 2

How does this statement relate to **Page 21 Table 2 - 2**? This statement is in conflict with the statement on **Page 33 Paragraph 2: Sentence 3**.

Page 41 Paragraph 3: Sentence 4

This statement does not agree with the statement on **Page 32 Paragraph 2: Sentence 3 (Bullet 3).**

Page 41 Paragraph 3: Sentence 5

This statement indicates that the water and sediment sampling methodologies are opportunistic also.

3.1.2 Surface Water Pathways

Page 41 Paragraph 3: Sentence 2

What exactly is "indirect discharges" from ground water? Was this determined using the oppotunistic sampling of springs?

Page 41 Paragraph 4: Sentence 2

Based on the information and methodology presented so far, the differences of contaminant concentrations from the two sample points is not enough to make a definitive statement indicating little or no difference.

Page 41 Paragraph 4: Sentence 3

This statement on high dilution factors is erroneous based on the information presented up to this point.

Page 41 Paragraph 4 Sentence 4

This statement is not based on scientific fact and has not been proved to the point of repeatability.

Page 41 Paragraph 4 Sentence 5

Refer to the statement on **Page 36 Paragraph 1: Sentence 1 (Bullet 3)**, the next time you are water skiing.

3.1.3 River Sediment Pathways

Page 41 Paragraph 6: Sentence 2

This statement establishes that there is no information of value on the sediment contamination.

Page 41 Paragraph 6: Sentence 3

Because no studies have been done, and no data collected, there is no evidence? Does this mean that the public shouldn't worry?

3.2 Contaminant Fate

Page 42 Paragraph 5: Sentence 1

Does this statement mean that because of the insufficient data, improper methods, poor record keeping, indifference to regulatory procedures, and disregard for scientific methodology that the public should disregard this report?

Page 43 Paragraph 1: Sentence 1

It is apparent that you have used these assumptions throughout this whole document.

Page 43 Paragraph 1: Sentence 2

The word incomplete should be inserted for the word preliminary.

3.3 Contaminant Transport

Page 43 Paragraph 2: Sentence 1

The data presented in **Section 2.2** is invalid due to the methodology, lack of quality assurance and lack of quality control.

3.31 Subsurface Transport

Page 43 Paragraph 4: Sentence 3

The term "flux" is defined to be: a product of total volume divided by the input. In this case the input involves the radioactive waste. The calculations have to be derived from mass balance calculations for each constituent and for all the interaction products between the individual contaminants and the reaction products between the contaminants and the host media.

Page 43 Paragraph 5: Sentence 2

This Statement is based on data that is essentially invalid for calculating plume concentrations, especially without considering speciation, exchange capacity, bonding affinity, ionic radius, exchange rates temperature, pH, Eh, ion selectivity, distribution coefficient of the host media, or the ground water flow system.

3.3.2.1 Computational Model Assumptions and Develpement

Pages 44 - 57

This computer model is too simplistic for making an assumption on ground water movement into a river system. The model does not take into account that the aquifers often intersect the river at oblique angles, thus greatly increasing the potential discharge surface area above and beyond the model used. The model does not take into account the time, or the permeability of the aquifer, or the mobilization coefficients of the contaminant species.

Page 79 Paragraph 3 Sentence 2

The neglect of considering these parameters leads to inadequate assumptions.

Page 79 Paragraph 4: Sentence 2

Assuming that the ground water investigations are complete is a bad assumption based on the information presented up to this point.

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Author	Addressee	Correspondence No.
Laurence E. Gadbois, EPA	Steven H. Wisness, RL	Incoming: 9307707

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